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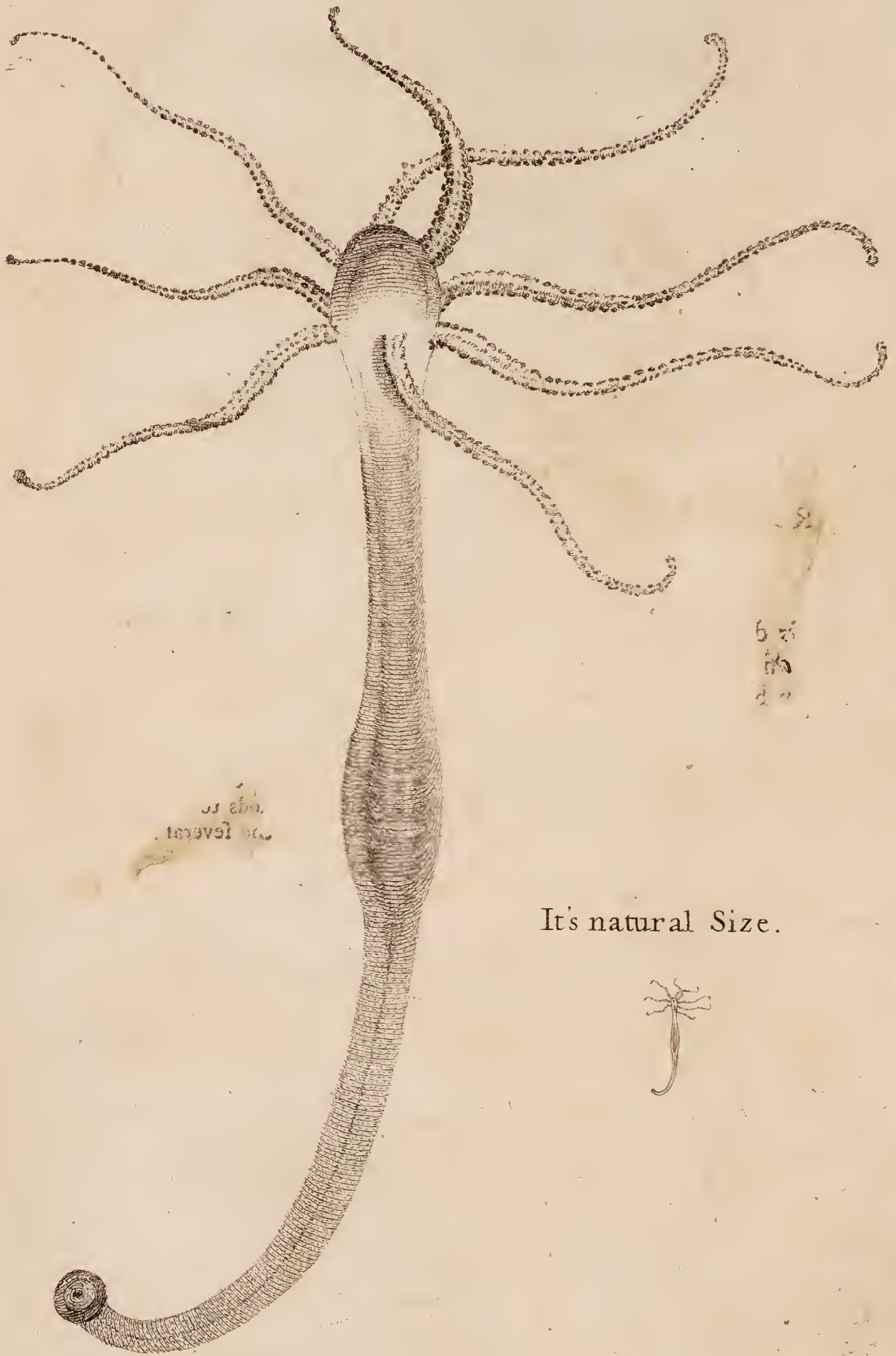


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THE POLYPE magnified.



It's natural Size.



An ATTEMPT towards a
NATURAL HISTORY
OF THE
POLYPE:

In A LETTER To
Martin Folkes, *Esq;*
P R E S I D E N T of the *Royal Society*.

DESCRIBING

T he different Species; the Places where to seek and how
to find them; their wonderful Production and Increase;
the Form, Structure and Use of their several Parts; and
the Manner they catch their Prey:

With an Account of their DISEASES and CURES; of their amazing
REPRODUCTION after being cut in Pieces, (as first discovered by
Mr. TREMBLEY, at the *Hague*;) of the best Method to perform
that Operation, and of the Time requisite to perfect the several Parts
after being divided: And

Also full DIRECTIONS how to feed, clean, manage and preserve them
at all Seasons of the Year.

Likewise a COURSE of real EXPERIMENTS, performed by cutting
these Creatures in every Way that can be easily contrived: shewing
the daily Progress of each Part towards becoming a perfect POLYPE.

The Whole explained every where by great Numbers of proper Figures,
and intermixt throughout with Variety of OBSERVATIONS and
EXPERIMENTS.

By HENRY BAKER, Fellow of the *Royal Society*,
and Member of the Society of *Antiquaries*, in *London*.

Rerum Natura nusquam magis quàm in Minimis tota est.
PLIN. Nat. Hist. Lib. xi. c. 2.

L O N D O N:

Printed for R. DODSLEY, at *Tully's Head* in *Pall-Mall*, and
sold by M. COOPER in *Pater-noster-Row*, and J. CUFF,
Optician, in *Fleetstreet*. 1743.

(Price bound Four Shillings.)



November 3. 1743.

At a Meeting of the Royal Society.

IMPRIMATUR.

M. FOLKES, *Pr. R. S.*





An Attempt towards a
NATURAL HISTORY
OF THE
POLYPE:

IN A LETTER to

Martin Folkes, Esq;

PRESIDENT of the *Royal Society*.

SIR,



THE Accounts (which thro' your Hands) we have been favoured with from Abroad, concerning the little Creature called a *Polype*, have appeared so extraordinary, so contrary to the common Course of Nature and our received Opinions of *Animal-Life*; that many People have look'd upon them as ridiculous Whims and absurd Impossibilities. In order, therefore, to set this Matter right, I beg you'll give me Leave to lay before the

Publick, through the same Channel, some Observations and Experiments on this Creature, made with the utmost Care and Attention, before several Persons of unquestionable Credit and Discernment, and written down from time to time with the strictest Regard to Truth.

That curious Observer of Nature, Mr. LEEUWENHOEK, first took notice of this Animal, and the uncommon Way its young Ones are produced, in the Year 1703. An Account whereof was by him communicated to the *Royal Society*, and made Publick in the 283d Number of the *Philosophical Transactions*: but its more amazing Properties were reserved for the Inquisitive and happy Genius of Mr. TREMBLEY to discover, in the Year 1739.

This ingenious Gentleman met with the *Polype* in his Searches after the minute Inhabitants of the Waters; and observing it in some Respects to bear the Resemblance of a Plant, and in others of an Animal, he resolved, by cutting it in pieces, to satisfy himself, whether of the two it really was; and found, by this Trial, that, after a few Days, each Piece became a perfect Body, of the same Form exactly as *That* of which it had only been a Part: which Appearance would have determin'd him to conclude it to be a Vegetable, had he not discovered in it at the same time, a frequent Change of Figure, a Motion from place to place, a greedy and voracious

voracious Appetite, and a singular Dexterity in catching, mastering and devouring Insects and Worms, though much larger and seemingly stronger than itself: Circumstances which could leave no doubt of its being a living Creature.

In consequence of these Discoveries, he, ever since, has been making a Variety of such Experiments as none but his own fertile Invention would, probably, have contrived. These Experiments were performed in Sight of many of the Curious, and communicated to that celebrated Naturalist Mons. REAUMUR at *Paris*, and to You, Sir, who so deservedly fill the President's Chair in the *Royal Society* at *London*: two Persons, the most unlikely, perhaps, in the whole World, either to be impos'd upon, or to assist in deceiving Others. Some of these Creatures were likewise sent both to Mons. REAUMUR and You, lest any Difficulty of finding them, might prevent, discourage, or delay making the same Trials in *France*, or *England*, as himself had done at the *Hague*.

Mons. REAUMUR assures us, in his Preface to the 6th Vol. of his *Memoires pour servir a l'Histoire des Insectes*, that he repeated the most material of Mr. TREMBLEY's Experiments; and, to his great Amazement, found every one of them exactly answer the Accounts given. And You, Sir, as soon as you received the Creatures, set about the

same thing, with all the Judgment, Candour, and Circumspection requisite in Cases of such a Nature; freely inviting Gentlemen to your House, to examine for themselves, and make their own Eyes their Informers. But, as every Body could not do this, you took the farther Trouble (in order to satisfy the general Expectation of the Town) of drawing up, in the clearest and most concise Manner, and laying before the *Royal Society*, the Result of such Experiments, as the short Time would give you leave to make, which you have since permitted to be published in the *Philosophical Transactions*, for the Information of all the World.

You was, likewise, so obliging to favour me with three of your *Polypes*, very soon after their Arrival, with Intent that I should put them to the severest Test; and, to encourage and assist me in so doing, have frequently honoured me with your Company, and been yourself a Witness of my Proceedings. To You, therefore, I owe my Testimony of the Truth, as given in the following Observations and Experiments, many of which were made under your own Eye; and, it is with great Pleasure, I seize this Opportunity of acknowledging my Obligations to you for Abundance of other Civilities and Favours.

With these three *Polypes* I began my Experiments, on the twenty fifth Day of last
March,

March, though the Weather was then excessively cold, and continued so to the End of *April*. And I have gone on till this very Day repeating most of them several Times over, without finding any considerable Difference, but that of a much quicker Growth and Separation of the Parts cut to Pieces as the Weather became warmer. A Difference not sufficiently important to render more than one Experiment of a kind necessary to be laid before the Publick. Though it may not be improper to remark, that what by Divisions, Subdivisions, and the Creature's natural Increase, several hundreds have been produced by my first three, between *March* the twenty fifth, and the present fourth Day of *August*.

These, however, were not all the *Polypes* I have had under my daily Care and Inspection: for on the eighth of *April*, Mr. ELICOTT, F.R.S. gave me six *English* Ones, taken in a Pond at *Hackney*; and they, since that time, have I believe produced me no fewer than your *Dutch* Ones did. From him I received, likewise, on the nineteenth of *May*, seven or eight green Ones, that were found in *Essex*; which have also increased considerably. And, in *July* last, you favoured me farther with some of the long-arm'd Sort, just then arrived from Mons. TREMBLEY.

I shall, by and by, more particularly describe these four different Species of *Polypes*,

and only transiently make mention here of them and their Increase, as some Proof that I have not formed Conclusions from single Instances, or wanted sufficient Numbers whereon to ground the Observations and Experiments I am hasting to lay before you.

In truth, from the Time I first had any of these Creatures, I have been examining them daily, both with and without the Help of Glasses, and have attended with the strictest Care to all their little Motions, Contractions, Extensions, and different Postures, as well as to their more extraordinary Properties, that I might thereby be enabled to give some reasonable Account of their Structure and Disposition.

Could, SIR, your other Cares and Endeavours for the Improvement of Natural Knowledge, by your Correspondence with learned Men both at Home and Abroad, and your hearty and unwearied Attention to the Concerns of the *Royal Society*, have permitted you to go on with and give a farther Account of your own Experiments, mine had never presum'd to think of appearing publicly; but since you was obliged to decline the Task (which nobody else amongst us, that I know of, has undertaken) and have been pleas'd to assist me with your Observations from time to time, as well as to take the Trouble of examining and considering mine; I am in hopes these Attempts may have some little Merit:

Merit: tho' they make no Pretence to that Clearness of Judgment and Expression which are so distinguishable in the Pattern you have laid before me.

All Descriptions of the Forms of unknown Things, or Things we are but imperfectly acquainted with, prove unintelligible, or at least unsatisfactory, without the Help of Pictures: I have, therefore, taken care to explain my Meaning all along by such Representations as I thought might be necessary to satisfy the Reader's Curiosity; and this I have done, more particularly, through the whole Course of my Experiments: where I presume it will be found agreeable, to see in what Manner, and by what Progressions, the Parts of *Polypes* cut in Pieces proceed, gradually, towards the Reproduction of all they want to render them compleat and perfect.

The great Number of Figures requisite for this Purpose, would have occasion'd too large an Expence, had they been engraven on Copper; and after all, as they could not then have been intermixed with the Letter-Work, but must have been printed on separate Leaves, would have produced a good deal of Trouble in turning continually to them: but by being cut in Wood, they lye much more conveniently under the Eye in the Places whereto they properly belong, and though not so beautiful as Copper-Plates, yet (being done by the best Hand we have) they

they may serve pretty well, I hope, to give an Idea of what they are intended to shew*.

You, SIR, who know my Way of thinking, will not I am persuaded so far mistake me, as to imagine I am attempting, by this Essay, to vie either with yourself, or Mr. TREMBLEY; but it may not be improper to assure that Gentleman and the World, who are not so well acquainted with me, that I am as far from, as unequal to, such a Design; and that my real and only Motive to the many Experiments I have made, to the Care I have taken in propagating these Creatures, to the Readiness wherewith I have sent Numbers of them to *Oxford* and *Cambridge*, and dispersed them, as much as I have been able, amongst the Curious, and to this present Undertaking, has been to vindicate the Truth: which suffers sometimes for want of proper Means to prove it: and to display before Mankind, a new Instance of the amazing Power of the Creator.

Permit me, SIR, e'er I proceed farther, to pay my Thanks to You, and to several other ingenious Gentlemen, who have obliged me with their Company and Assistance at many of my Experiments; and particularly

* These Draughts were taken from the Microscope, as magnified by the fifth or sixth Glass, which enlarges the Object no more than what is just sufficient to shew it distinct and clear.

to my good and worthy Friend Dr. JAMES PARSONS, F. R. S. who, together with an unbounded Curiosity, a sincere Love of Knowledge, and a penetrating sound Judgment, is peculiarly happy in being capable of giving his Ideas a Reality by the Excellence of his Pencil.

As a Division into *Chapters* will render what follows more useful than it would be otherwise, I shall make no Apology for so doing.

C H A P. I.

The General Appearances and Motions of the POLYPE.

WHEN we examine any living Animal, the first thing that naturally presents itself to our Observation, is its Form or Shape: but this wonderful little Creature shifts its Posture so often, that it is difficult to ascertain its real Form, and would be almost endless to describe the several Changes thereof. The most frequent is that of extending and contracting its Body and Horns, or rather Arms*; which it can perform, to such a Degree, as to render itself ten or twelve Times longer at one time than another. It usually fastens by the Tail, either to the Bot-

* As these Parts serve the Purposes of Arms rather than Horns; I shall chuse all along to call them by that Name.

tom or Side of the Vessel it is placed in, and thus situated, stretches out, or shortens itself at Pleasure. Some of its Forms under these Circumstances are hereunto annex'd.



I have sometimes seen the same *Polype* in all these Postures, within the Compass of an Hour.

EXPLA-

EXPLANATION of the FIGURES.

The first Line of four Figures, shews the Polype in its most contracted State.

The next two Figures, that appear with Wrinkles on their Sides, represent it when about half-way contracted: and the third Figure shews it almost quite contracted, hanging by the Tail.

The several Degrees of its Extension, and its manner of Appearance, are represented by the other Figures.

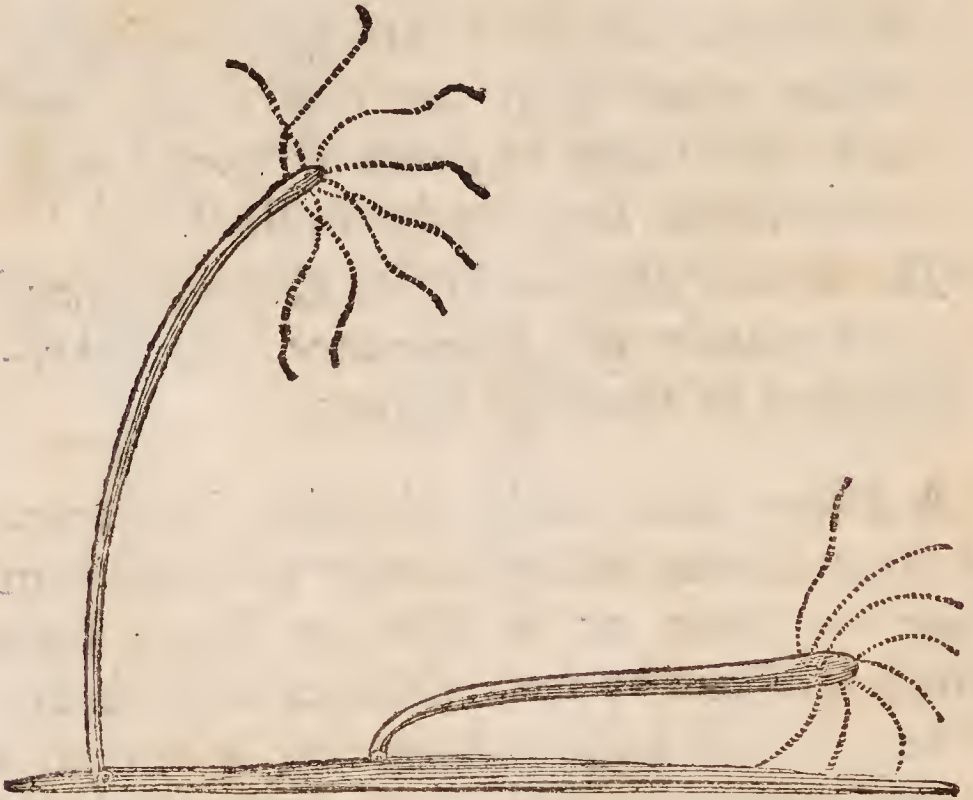
A *Polype* turns itself, likewise, into several other Forms, either in order to crawl from place to place, or to seize its Prey; both which it effects by the Assistance of its Arms. When it would move forwards, it stretches out the Arms and Body, and fixing its Arms to something, draws up its Body towards them by Contraction in this manner.



Its Way of moving backwards is, by lengthening out its Tail, and drawing back its Head and Body, in a Manner just contrary to that above described.

It has two Methods of moving sideways: one is, to erect itself on the Tail, and incline

cline its Body which Way it pleases; the other is, by an odd Position of the Arms, to roll its Body over and over, sideways, as it lies extended.

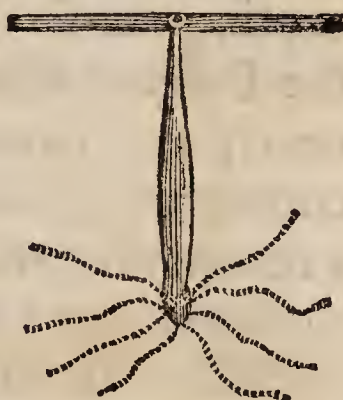


When the *Polype* would turn itself about, it brings the Head and Tail together, by bending its Body; and then, fixing the Arms, directs the Tail-Part that Way the Head-Part lay before, as in the Figures underneath.



It likewise uses another very extraordinary Sort of Motion with its Arms and Body, whereby, crawling up the Sides of the Vessel to the Top of the Water, and hanging there by the Tail, with its Body and Head downwards, it rows itself about by the Help of its Arms, in quest, I suppose, of Prey. This I have sometimes, tho' not often, seen: but I make no doubt it may frequently do thus in Ditches, with Design to catch several Kinds of Flies and Insects, that are to be found only near the Surface.

It then appears in this Manner, with an Air-Bubble at its Tail.



It also hangs sometimes upon the Surface of the Water with the Tail downwards, and appears thus.



And sometimes it lies along, extending its Body and Arms on the Top of the Water, as in this Figure.



This

This Creature has a Variety of other Postures, which it would seem trifling to attempt describing: fastening itself sometimes to the Vessel by its Head and Arms, and raising its Tail upright: coiling its Body, at other times, in a circular Figure, and covering its Head with its Tail; and frequently rubbing or stroking its Head and Body with its Mouth and Arms, as it were to clean or dress itself, or remove some Uneasiness it feels.

Its common Motions are very slow, excepting those of extending and contracting the Body and Arms, which are performed in nearly the same Time as a Snail takes up to come out of, or retire into its Shell, and in a manner not much unlike it. In seizing and mastering its Prey it is however surprizingly nimble. It can lengthen out or shorten its Arms, without extending or contracting its Body; and can do the same by the Body, without altering the Length of its Arms: both, however, are usually moved together, at the same Time and in the same Direction.



C H A P. II.

Of the Sorts of POLYPES.

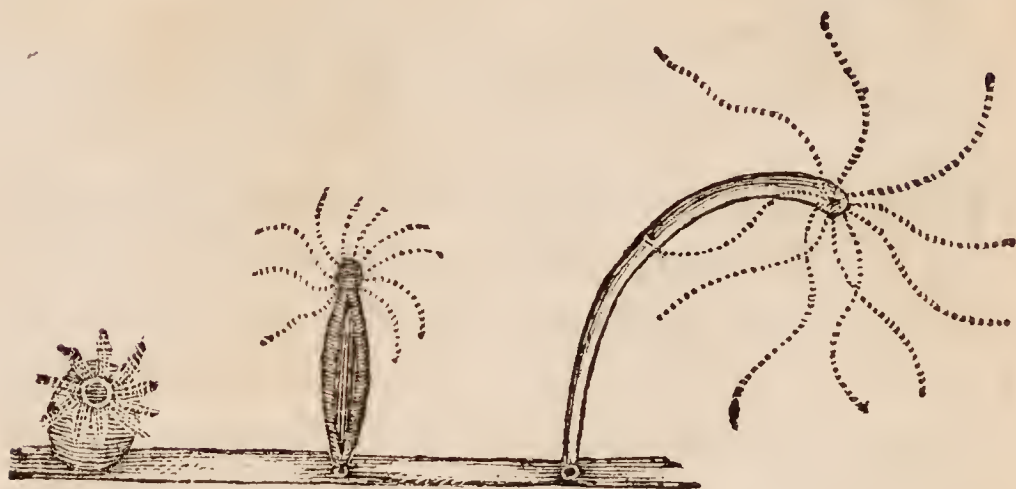
THERE are, no doubt, several Species of *Polypes*, differing from each other in many particulars as well of Figure as Size. I have, at present, four Sorts in my Glasses, whereof I shall give a brief Description, and shew the Figures of them all, in their contracted, in their middle, and in their extended State.

The First, is that Species Mr. TREMBLEY sent from the *Hague* in *March* last, some of which (as now grown) have Bodies, when fully extended, more than an Inch and half long: tho' the same, when contracted, exceed not one tenth of an Inch. In this shorten'd State a little Knob or Button, somewhat transparent, appears at their posterior End, and may be call'd a Tail; but when they are stretched out, it differs so little from the Body as scarce to be taken notice of. When full, or contracted, their Bodies appear of an Hair or light Chestnut-colour, but when empty and extended are almost white. Their Number of Arms is from eight or ten, to twelve or fourteen, tho' the

C

most

most common Number is ten. The Colour of the Arms is white.



My Second Sort were taken in a Pond at *Hackney*, and given me by Mr. *ELLICOT*, at the Beginning of last *April*. When first they came to me, they were much smaller than the *Dutch* ones; but by Care and good Feeding are now grown rather larger than they. The Tails of these are long, slender and transparent, and when placed before the Microscope, a long strait Gut may plainly be distinguished passing from the Body-Part or Stomach to an Opening at the End thereof. These are rather lighter-coloured than the former, and have seldom more than six or eight Arms, but those capable of great Extension. Some Figures of them are in the following Page.



The Third Sort are of a Grafs-green Colour. These were also given me by Mr. ELLICOT, about the Middle of *May*, and were taken, he told me, by Mr. DU CANE, in *Essex*. They were extreamly small when I received them, being at their utmost Extension not above a quarter of an Inch in Length, and different from my other *Polypes*, not only in Colour, but likewise in their Arms, which were much shorter in proportion to their Bodies, capable of but little Extension, and narrower at the Root than the Extremity, which is contrary to the other Species. Their Arms were so short, they could not clasp round a very small and slender Worm, but seem'd only to pinch it fast till they could master and devour it, which they did with as much Greediness as any. I imagin'd these *Polypes* owed their green Colour to

some particular Food, such as Weeds, &c. and that they would lose it upon being kept to Worms; but I find myself mistaken, for they retain their Greenness after some Months as well as ever, and are now grown of a moderate Size, extending sometimes three quarters of an Inch; their Arms are also lengthened very much to what they were, and are of a lighter Green than the Body, their Number eight, nine, or ten. The Tail is very little slenderer than the Body, but more spread at the End than the Tails of other Kinds.



My Fourth Sort, are some of the long-armed Ones, which you, SIR, received at the End of *July*, from Mr. TREMBLEY, and, the next Day after their Arrival, was so good to present to me. These are the lightest coloured I have yet seen, being when hungry, and extended, almost quite white; and when full, of a kind of Pink Colour: both which Appearances I impute to the exceeding Thinness of their Skin. In all *Polypes*, when first a Worm is swallowed, the Shape of it may be seen (and that doubled most commonly) in the Stomach: but after a little

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while,

while, as it digests and dissolves there, the Form of it disappears, and it only gives a Colouring to the *Polype's* Body: both which Circumstances are most remarkable in this Kind; for in These the Worm is discerned more plainly at the first, and the Blood and Juices afterwards, in Digestion, give a pleasant ruddy Tinge; whereas they only render others of a dark and dull Colour.

But These are more particularly distinguished by having Tails very long, clear and slender, even in their most contracted State, and by Arms capable of a most surprizing Extension (even to several Inches) tho' the Body is not longer or larger than that of the other Species, with little Knobs or Buttons at their Extremities. A fuller Account of them will be given, when I come to describe the wonderful Structure of a *Polype's* Arm, and therefore, it may be sufficient to observe farther here, that they seldom are more than six in Number. The Manner of their Appearance is shewn in the following Page.



From your Kindness, SIR, in permitting me to have a Sight of Mr. TREMBLEY's Letters, I am able to inform the Publick, that the Industry of this Gentleman has discovered still more Sorts of *Polypes* than the abovementioned; and, particularly One, that is very extraordinary for having about its Head fifty or threescore little Horns or Arms; all which together, when the Animal is undisturbed, make a circular Motion in the Water like the turning of a Mill-Wheel, and

and thereby form a Current that brings along with it many small Insects within the Reach of its Arms, which instantly catch them, and after a most wonderful Manner convey them to the Mouth. This Sort he calls *Polypes à Pennache*, or, *plumed Polypes*; from the Resemblance their little Arms bear to Feathers. They adhere, he says, to the Stalks or Roots of Water-Plants, and have a Skin or Case, whereinto, when disturbed, they withdraw their Bodies and Arms: but as soon as all is composed and quiet, they put them out, and go to work again.

This Description inclines me to believe, they are the very same Animals Mr. LEEUWENHOEK took notice of, as living in a Sheath or Case, (which they fasten to the Roots of Duck-weed) and having two seeming Wheels with a great many Teeth or Notches, coming from their Heads, and turning round as it were upon an Axis: but, he tells us, at the least Touch, the Wheel-work is drawn into the Body, and the Body into the Sheath. The Particulars of Mr. LEEUWENHOEK'S Account, and two or three Figures of the Creatures themselves, are given in the 91st Page of my *Treatise on Microscopes*, to which, therefore, I must beg leave to refer. But I must just observe, that if this Animal is really the *Plumed Polype*, it affords fresh Occasion of admiring the Diligence of Mr. LEEUWENHOEK, whose careful Searches

few Things seem to have escaped; and also of remembering, that it was he, who discovered another Kind of Animal with two Wheels at its Head-End, forming a like Current, and probably for the same Purpose, in a reddish Mud or Earth found frequently in leaden Pipes or Gutters on the Tops of Houses: whereof a Description is likewise given in *Page 92.* of the Book above referr'd to. When the Water dries away, they contract their Bodies into an oval Figure of a reddish Colour, and become fix'd in the dry Dirt: which being put in Water, though after several Months, in about an Hour's Time they open, by Degrees extend their Bodies, swim about, and play their Wheel-work. Thousands of these I have now by me: they are easily got, and kept, and highly deserve the strictest Examination and Admiration of the Curious.

C H A P. III.

Of the POLYPE's Body.

THE Body of a *Polype* has no Part that that can be called either Back or Belly; but appears, when extended, like a round Pipe or Tube, and when contracted, like the Seed-Vessel or Head of a Poppy. It consists of two Coats, between which there lies a
Space

Space that always remains transparent, even when by Fullness, or Contraction, the other Parts are rendered quite opaque: and in this Space the Microscope discovers a Kind of fluctuating Motion, very much like that in the Arms, wherewith it seems to communicate. The outward Coat is white like the Arms, and made up of minute *Annuli* or Ringlets, that double in the midst, and can, occasionally, be folded close together, in the manner of a Paper Lanthorn. These may plainly be seen, when the Body is in its middle Degree of Extension: but when it is quite stretched out, they become unfolded, and consequently not distinguishable; and when quite contracted, are not perceivable, by their being brought too close. The Appearance of them may be understood by some of the foregoing Draughts.---See the Figures, *Page 12 and 14.*

Such a Structure accounts, in some measure, for that extraordinary Ability this Creature has, of so extending or contracting every Part about it, that it is difficult, if not impossible, to ascertain the real Length or Thickness of any. It will easily be conceived that the Thickness must increase as the Length diminishes: for its Body is, probably, composed of longitudinal, and circular, or perhaps spiral Fibres, both capable of great Extension or Contraction; and which counteract, in such a Manner, that when one extends,

tends, the other must necessarily contract, and *vice versa*. I have seen *Polypes* with Bodies almost three Inches long, and as thin as the smallest Straw, that have been shortened in a Moment to less than a quarter of an Inch, with the Thickness of a Goose-Quill. But such large ones are very rare, and one seldom sees 'em above an Inch, in their extended State. They can stop themselves at any Degree either of their Extension or Contraction.

When a *Polype* lengthens out its Body and Arms, which it seldom does but when empty and hungry, its Form is not very unlike a Whirl or Joynt of the Water-Plant called *Equisetum* or *Horse-Tail*, (as in the Figure) and it has then pretty much the Whiteness and Clearness of a wetted Bladder; but when full, or empty and contracted, it appears of a dark Colour and opaque. The longer it has fasted, the more transparent it becomes: but whether full or empty, the Tail-End, for a little Way, always retains its Transparency; the Stomach appearing to terminate at some Distance from its Extremity. In the contracted State this Tail-End seems like a short Knob or Button, but extends



extends with the Body of the *Polype*. Some Sorts of *Polypes* are distinguishable by the Length of this Tail-Part, which in them is much slenderer and clearer than the rest of the Body: and it is remarkable, that these long-tail'd *Polypes* have commonly long Horns also. The *Polypes* found at *Hackney*, and given me by Mr. ELLICOT, have this Length of Tail, and so have the long-arm'd Sort you lately receiv'd from Mr. TREMBLEY, with some of which you was so kind to oblige me. Through the Middle of this long Tail a Gut is very plainly distinguishable by the Microscope, (which cannot so easily be perceived in the shorter ones) passing from the Stomach to an Opening at its Extremity, which I shall call the *Anus*: since I have, several times, seen the Dung of the *Polype* in little round Pellets discharged at this Outlet or *Anus*.

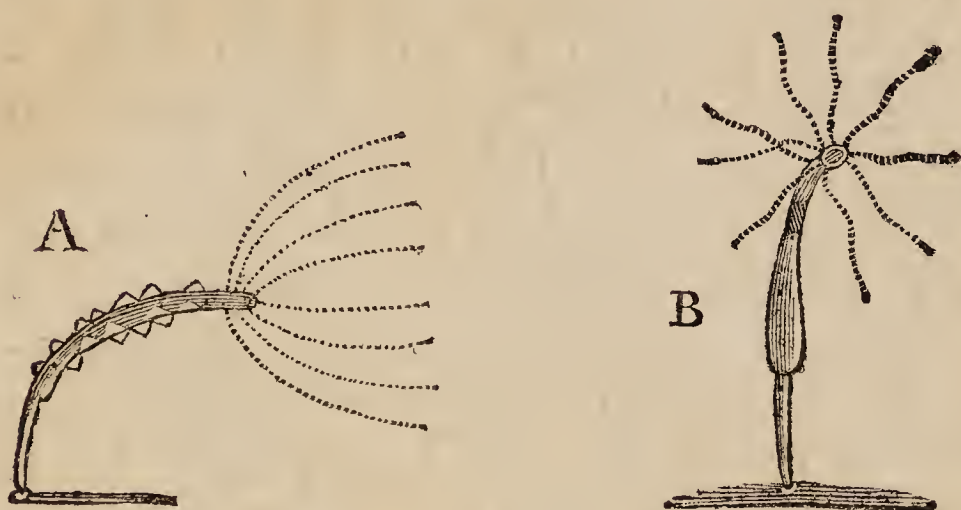
Much the greater and grosser Part of what the *Polype* eats, is most certainly thrown out again by the Mouth, after lying a proper Time to become digested in the Stomach: and, for a good while, I imagined there was no other Evacuation; but am now convinced, that the finer Part, in small Quantity, is carried downwards through the Tail, and pass'd off that Way. I believe, however, there is also another Purpose to which this Passage serves, and that is, to convey a *Mucus* or slimy Matter to the End of the Tail,
for

for its more ready Adhesion to Sticks, Stalks, or other Bodies. And this I am inclined to think, not only from its fixing constantly by that Part, but likewise from observing a Redundance of such *Mucus* frequently flowing from it: then, especially, when the Tail has been cut off, before it gets a Head, and consequently whilst there are no *Fæces* to be discharged thereby. A Slime or *Mucus* will likewise issue from other Parts, tho' not in so great Abundance; but, whencesoever it comes, the *Polype* should be assisted to get rid of it, by being washed in fresh Water, and having it gently pulled away. For it will occasion a Dissolution or Beginning Mortification, that will grow daily worse and worse, unless proper Care be taken; and, even after all, it becomes sometimes an incurable Disorder; in which Case, the shortest and best Remedy is, to cut off the distemper'd Part, since in a few Days after the *Polype* will then become as perfect as ever.

The most effectual Method of preventing this Disorder is, to give them fresh Water every two Days at farthest, if the Glasses you keep them in are small: for otherwise the Water grows so charg'd with this slimy Matter, that it seems as if full of Cobwebs, and much inconveniences the *Polypes*. When this Slime is viewed in the Microscope, it seems to be a Congeries of long slender Hairs, like exceeding fine Flax or Wool: this en-
tangles

tangles in the delicate Arms of the *Polype*, prevents their Motion, and disables them from taking their Prey.

When a *Polype* extends in Water, its Body commonly seems smooth and slippery, and has a good deal the Resemblance of a Snail's; but on some there are several white protuberant Substances standing out from the Sides, and appearing pointed and irregular. Others have a remarkable dark Spot across the Body, especially when not quite empty. Both these Cases are represented by the Figures A and B.



Permit me, SIR, for my Readers fuller Information, to add your Account of the *Polype*, from the *Philosophical Transactions*, N^o. 469. Page 424. Your Words are These;
 “ When most contracted, it looks like a
 “ little Ball, from one Part of which rises
 “ a small Knob, not unlike what is com-
 “ monly seen at the Head of a Lemon: This
 “ is the Tail. and upon this the Insect, in
 “ this

“ this Cafe, generally refts. Oppofite to
 “ this is the Mouth, round which the Arms
 “ appear regularly extended, and refemble a
 “ little Star, as ufually represented; all whose
 “ Points feem to proceed from the fame
 “ Center. But when extended, the fame
 “ *Polype*, which, in the Pofition juft descri-
 “ bed, fcarce appeared one tenth of an Inch
 “ in Diameter, has drawn itfelf out to full
 “ three quarters of an Inch in Length: In
 “ which State the Mouth does, for the moft
 “ part, project like a fmall and fharp Snout
 “ in the Midft of the Arms.”

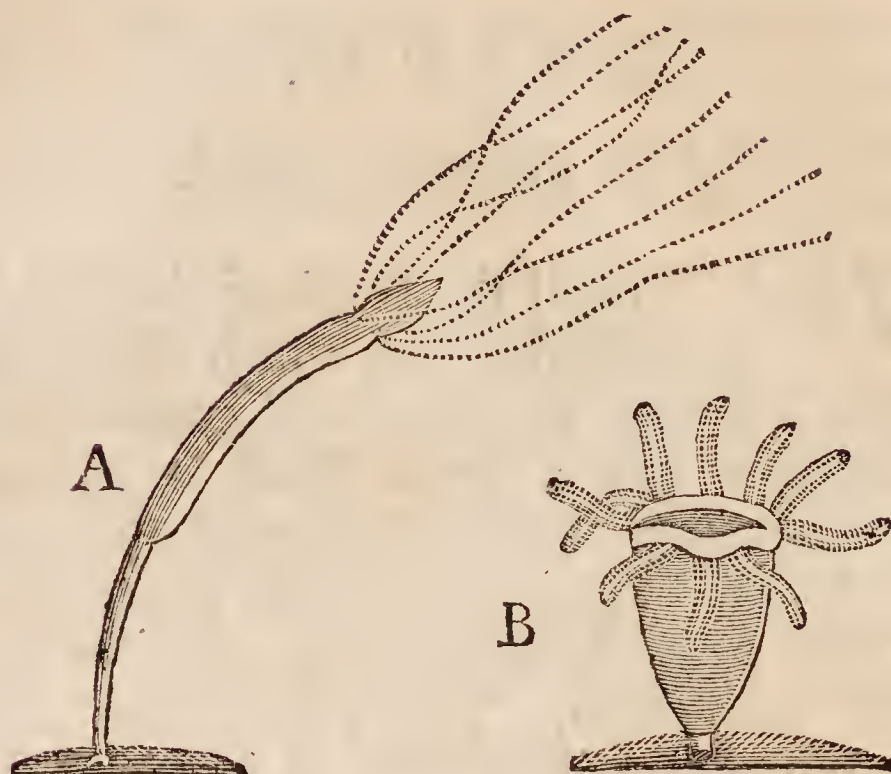
Although I do not pretend to have yet
 been able perfectly to diftinguifh fuch, I
 have Reason to believe there may be certain
 minute Scales, or Protuberances, or fome
 Sort of little *Spiculæ* or Hooks all over the
Polype's Body, which it can lengthen and
 protrude, or draw in and lay flat, occasional-
 ly: for, if a Worm happens to touch any
 Part of the Body, one fhall plainly fee it
 catch'd and held faft, one knows not how,
 till the Arms can be brought to fetter and
 convey it to the Mouth: the Worm too in-
 ftantly begins to ftuggle, and fhews great
 Senfe of Pain, but can very feldom get
 away; which almoft proves it muft be held
 by fome invifible Hooks or Clafpers running
 into it, and which are probably of the fame
 Sort as thofe along the Arms.

CHAP.

C H A P IV.

Of the POLYPE's Head.

W H A T I call the Head of the *Polype*, is that anterior Part which rises in the Center between its Arms, and appears most commonly like a round Knob or Button; tho' sometimes it extends beyond the Arms to a small Distance, in a conic Figure, and at other times is so drawn in, as to be on a Level with them. The Term Head must not however raise an Idea of its being like the Head of other Animals, furnish'd with Eyes, &c. (for this Creature has no Eyes that I have been able to discover :) but I call it so, because here the Opening or Mouth is placed, whereby it takes in its Food. The Figure of this Part changes from time to time, according to the Disposition and Wants of the Animal. When hungry, or going to seize its Prey, it pushes out a Kind of Snout, and ends in a sharp Point; but at the Time of swallowing, it forms a circular Mouth or Opening, that gapes and stretches much wider than one would imagine possible.



- A. Represents a Polype with its Snout and Arms extended, in the Posture of seizing its Prey.
- B. Shews a Polype contracted, with its Mouth wide open, and its Body like a Sack or Bag.

We shall never, perhaps, be able to discover, certainly, by ocular Demonstration, whether the Mouth of this Creature is really armed with Teeth; but we may conjecture it so to be, from the Ease wherewith it bites or breaks the Skin of a Worm, in order to suck the Blood and Juices: as, if the Worm be large, it is constantly found to do, till the Body is reduced to a Size capable of being swallowed. There is, likewise, a farther Probability of its having such offensive Weapons, from the violent and painful Agonies
a Worm

a Worm expresse the Moment it is taken hold on by the *Polype's* Snout, and from the sudden Death that follows; which, considering the Nature of a Worm, and the Difficulty of killing it by pricking it, or even cutting it in Pieces, would almost incline one to imagine there must be something poisonous in the Bite; and that the *Polype*, as well as the Viper, does not only bite, but even inject a Venom into the Wound it gives, for the more speedy Destruction of its Prey.

I have sometimes forced a Worm from a *Polype*, the Instant it has been bitten, (at the Expence of breaking off the *Polype's* Arms) and have always observed it to die very soon afterwards, without one single Instance of a Recovery: wherefore you, SIR, and other curious Gentlemen, who have made the like Observations already, or shall hereafter make them, will, I hope, excuse my Conjectures, as not wholly void of Reason, since in many Cases we have no way of coming at the invisible Causes of Things, but by arguing from their visible Effects.



C H A P. V.

Of the POLYPE's Arms.

THE *Polype's* Arms are of so curious and amazing a Contexture, that 'tis impossible to describe the Pleasure arising from viewing them before the Microscope; without which no tolerable Conception can be obtain'd of their Beauty, Form, and Contrivance.

The Colour of them is white. They are disposed in the most regular Order round the anterior End of the *Polype*, which I have called its Head, and when fully extended, command a Circle of several Inches in Diameter; into which if any Worm or small Insect ventures, it runs the same Danger that a Fly does, when within the Circumference of a Spider's Web.

The Number of Arms, in *Polypes* come to their full Growth, seems not fixt or certain, even in the same Species; and is very different as the Species differ. Those from Abroad have generally 8 or 10, some 11, 12, 13, and even 14. The *English* Ones 4, 6, or 8, and sometimes, tho' but seldom, 10. I never saw a *Polype* separated from its Parent with less than 4 Arms. But whatever their Number be, they are placed at equal Distances in a Circle round the Head. They
are

are not however produced all at one Time, nor are always of the same Length one as another. Such *Polypes*, for Instance, as have 8 Arms when full grown, usually put forth only 2 at first, directly opposite to one another: in some Hours 2 more appear, exactly between these: and shortly after 4 younger Ones rise out between the other 4. So that till the last attain their full Growth, which requires about a Week, they are shorter than the rest: and, indeed, it is difficult to know whether they are at last all naturally of the same Length, since they are often broken by Accident; and if not, their odd Contractions and Extensions may deceive all our Observations in this respect, as they often contract some of their Arms at the Instant they are extending others †.

The general Form of a *Polype's* Arm, when the Creature seems quiet and most at Ease, bears so near a Resemblance to the Arm of a Star-Fish, that by examining the latter, we may form a reasonable Conjecture of many particulars in the former, which by its Smallness we are incapable of discerning perfectly. The Arm of a *Polype* is flat on one side, somewhat circular on the other,

† One shall see sometimes a divided or double Arm, or an Arm growing from the Side of another Arm; but this must be regarded as a mere *Lusus Naturæ*.

and tapering from the Root to the Extremity. The flat Side is that directly forwards, whose Appearance makes it probable it may be furnished from End to End with Rows of little moveable Pipes or Suckers, as the Arms of a Star-Fish are: but this Conformation is not equally perceivable in every Kind of *Polype*; for the Arms, in some, discover very little of the Flatness above described; and I believe all Sorts of them can give a round Figure to their Arms, occasionally, either in part, or in the whole. On the convex-side, and along the Edges, are numberless *Papillæ* or Protuberances, from each whereof two or three pretty long Hairs issue *: which *Papillæ* and Hairs, together with the moveable Pipes or Suckers, serve as so many Hooks or Claspers to catch and hold its Prey, even before the Arm can bend itself to encircle and secure it perfectly.

The Arm being transparent, a most beautiful Arrangement of Articulations, not much unlike the *Vertebræ* of some Animals, may very plainly be discerned in it, with a large Vessel like a Spine passing through them from the *Polype's* Body to the Extremity of the Arm. These Articulations, when the Arm

* These Hairs were discovered by drying the Arms, and then examining them by the Microscope: for when the Creature was alive, and the Arms moving in the Water, I could not be certain of them.

s extended, are seen at considerable Distances from each other; but when it is shortned they come quite close together, and render it almost opake.

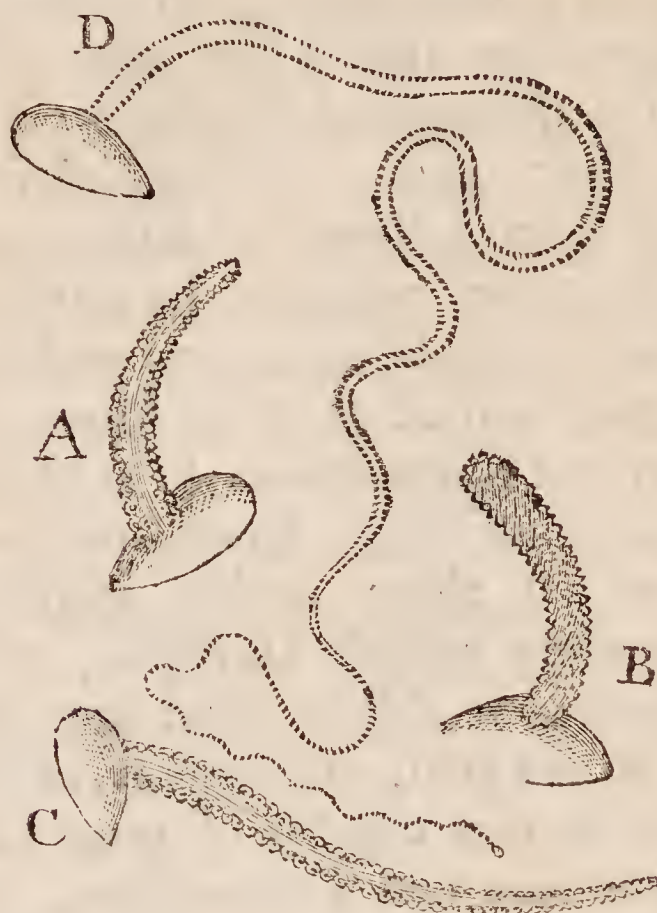
Your own Description, SIR, of all this is so expressive, that I beg leave to copy it from the aforequoted *Philosophical Transactions*, Page 427. “ Each Arm consists of several Rows of Knots or small *Papillæ* joyned together by a transparent membranous Substance, and which is endowed with a most exquisite Power of Extension and Contraction: so as thereby to bring any of those Knots nearer together, or set them farther asunder, and that in every possible Direction, whereby the Animal is able to bend any of these Arms in any part, and all Sorts of Ways.”

As the Arm is capable of great and gradual Extensions and Contractions, its Appearance is very different in different Degrees of such Extension or Contraction. When extended to the utmost Stretch, its Fineness is exquisitely delicate, and it looks like a String of Beads, or knotted Thread, with the Beads or Knots widely distant one from another. When it is about half extended, it much resembles the *Chenille* * Women use in their Works, which they erroneously call

*. The French Word *Chenille* signifies a Caterpillar, and not a Snail.

Snail: and when quite contracted is very much like the Arm of a Star-Fish.

The following Figures will explain my Meaning better.



- A. Represents the Arm of a Polype contracted, and exactly like one of the Radii of a Star-Fish.
- B. An Arm contracted in another Manner, and thickened at the Extremity.
- C. An Arm about half-way extended.
- D. The Arm of a long-armed Polype fully extended, with a little Knob or Button appearing at its End.

It is impossible to tell what numberless Parts each of these Arms is composed of, all
of

of which being in continual Motion, form together one of the most surprizing Sights in the World. The Strength of these Arms, the Purposes whereto they serve, and the Dexterity of the Animal in the Management of them, are also wonderful. They are employ'd both as Legs and Arms; for by means of them the *Polype* crawls from place to place, and with them he takes his Prey. The Variety of their Posture, and the Extension of some sorts of them from one Line to the Length of several Inches, is delightful and amazing.

His Grace the Duke of RICHMOND, in a Letter which you was so obliging to communicate to the *Royal Society*, says, if I remember right, That he saw some *Polypes* in Mr. TREMBLEY's Study at the *Hague*, hanging by their Tails to the Surface of the Water, in Glass Jars a Foot deep, and extending their Arms nine or ten Inches down into the Water. And I myself have frequently seen them three or four Inches long, even in our *English Polypes*, which are not, I believe, the same Sort as those long-armed Ones of his: mine too would probably have extended their Arms much farther, if the Vessels I kept them in had been as convenient for them, as Mr. TREMBLEY's were *.

* Mr. LEEUWENHOEK took notice of their being able to extend their Arms so surprizingly, that they seem'd, thro' the Microscope, to be several Fathoms in Length. *Philos. Transact.* N^o. 283.

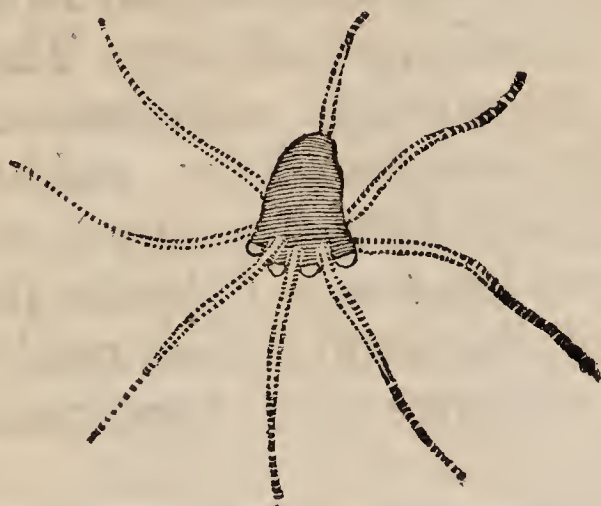
Another extraordinary Circumstance is, that a *Polype* can extend an Arm in any Part of its whole Length, without doing so throughout, and can swell or lessen its Diameter, either at the Root, at the Extremity, in the Middle, or where it pleases: which occasions a great Variety of Appearances, making it sometimes terminate with a sharp Point, and at other Times blunt, knobbed, and thickest at the End, in the Figure of a Bobbin.

There are different Species of *Polypes* distinguishable by their Arms, some having them shorter and thicker, others more long and slender: some rounder, and others flatter. In some Sorts too there are little Balls or Buttons at the Extremities, more opake than any other Parts of the Arm, which at first View I was not wholly without suspecting to be the Creatures Eyes, placed as a Snail's are at the End of its Horns; but my Observations since have not afforded any good Reason to continue such an Opinion.

The Arms of all the *Polypes*, I have seen, are white, (except those of the green Sort, whose Arms are also green, but paler than the Colour of the Body:) they are endued with a most exquisite Sense of Feeling, can bend either backwards, forwards, sideways, or in any Direction, as easily as a Thread; and tho' extended to a great Distance, and scarce so thick as a fine Cobweb, are strong enough to seize a Worm much bigger and
more

more nimble than the *Polype*, and hold it so fast it can hardly stir.

Between each of these Arms, when the *Polype* stands on its Head (as it frequently does on being removed into fresh Water) a Sort of fine Scale, like the Scale of a Fish, may be perceived projecting sideways from it, as in the Figure.



In order to prove more fully what a great Similitude there is between the *Polype's* Arms and those of the Star-Fish, and indeed between the two Animals in general, I shall intreat your Patience, whilst I lay before you the Substance of the Description Dr. GREW gives in his Account of the Rarities of *Gresham College*, of some *Star-Fishes*, at that Time in the Repository of the *Royal Society*.

He calls one Sort of these *Stella Marina lævior*, the *smooth Star-Fish* or *Sea-Pad*. It was sent, he says, from the *East-Indies*, and, when alive, is of a *Flesh-colour*. It hath

hath five Arms or Rays each an Inch broad, and more than five Inches in Length. The Trunk not above an Inch and half in Diameter. The upper or convex Side is wrought all over with very little lenticular Knobs, almost like a *Chameleon's* Skin, with small Concavities interjected, like those in Poppy Seed. Underneath, each Arm is furrowed, the Margins of the Furrows being set with a Kind of curious Fringe. The Margins of the Arms wrought with lenticular Eminencies set in a strait Row, and besprinkled as it were with little Centaury Seed.

Whoever has seen a *Polype* in the Microscope, will be sensible how nearly this Description answers the Appearance of its Arms.

He describes likewise the *prickled Star-Fish*, or *Stella Marina hirsuta*. It hath five Arms, each Arm pointed, and also slender or narrowed next the Trunk, but spread in the Middle: two Inches and three Quarters long: the Trunk itself not above half an Inch Diameter. The upper Part hath a rough Shag of short Prickles, the other of longer: where also the Arms are furrowed. These innumerable Prickles upon their Arms are all moveable, as in the *Sea Hedge-Hog*.

As he proceeds to treat of other Kinds, he describes among them, one whose Arms are set round about with little Knobs like Pins Heads, lesser upon greater, and another
Kind

Kind with Spikes upon its Arms, rang'd in certain correspondent Orders.

He also gives an Account of the *Stella Marina arborescens*, or *branched Star-Fish*, taken in the *West-Indies*. It is, he says, above a Foot Diameter. The Mouth in the middle is divided into five Lips. The Figure both of this and of the Trunk or Body is pentangular. The Diameter of the Trunk almost three Inches. The Sides grow thin from the Mouth to their Edges, which are so many exact *Hyperbola's*. From the five Corners of the Trunk as many Branches being produced, are presently each divided into two others, about an Inch in Compass; round, but by a double Row of little Knobs seeming to be square. Each of these are again subdivided into lesser and lesser Branches, the last whereof are scarce thicker than a Horse-hair. In Number, by a moderate Estimate, above a Thousand.

As he swims, he spreads and stretches out all his Branches to their full Length; but so soon as he perceives the Prey within its Reach, he hooks them all in, and so takes it as it were in a Net.

This Sort of Star-Fish has a long Pipe or slender Body, extending from the middle of its Arms, like the Form of our little *Polypes*: and, when in the Sea, can certainly extend its Branches some Yards in Diameter. The fine Extremities of the Arms, are, when dried,

dried, extremely brittle, and from the Smallness of the Number here mentioned, were, I believe, many of them broken off in this Subject, since we are told, *Philosophical Transactions*, N^o. 57. That the Divisions of the Branches in another of the same Kind were numbered as far as eighty one thousand nine hundred twenty, and that when the Fish was alive they might probably have been distinguished farther, all which slender Threads through their whole Length have Claspers issuing from them *.

Describing also what he calls the *Preke* or *Poulps*, POLYPUS. 'Tis, he says, *a naked Fish*, having eight Fingers or Arms, spread out almost like the Rays of a *Star-Fish*, and the Mouth in a Manner in the Middle of them. Their Arms serve them both to swim with, and to attack their Prey.

He remarks, that all *Stars* have their Mouths in the Middle; but doubts of what RONDELETIUS says, that they seem to have no other Passage for their Excrement. He adds, they take their Prey as the *Polypus*,

* One of these Fishes is to be seen, dried and extended, in the *Royal Society's* Repository, but its tubular Body is taken away to make it lie flat, and the fine Extremities of its branching Arms are cut off, to bring it within the Compass of a Box whose Diameter is about fourteen Inches. It was taken in *Massachusetts Bay* near *Newfoundland*, and is said, by a Writing on the Box, to have had 81,920 Branches.

and swim very swiftly, by stretching out or contracting their Arms at Pleasure.

My dwelling so long on these Descriptions of Dr. GREW, may be, I hope, excusable: as my Intention thereby is, not only to give a more distinct Notion of the *Polype's Arms* than can any other Way be done; but to shew, likewise, that the general Resemblance between the *Sea-Polypes*, or *Star-Fish*, and the Animal we are treating of, is so great, that we can scarce hesitate to look upon it as a real *Fresh-Water Star-Fish*, of which it is possible there may be as many different Species as in those of the Sea Kind: and that all the Variety of Arms either as to Number or Structure, which are observable in the one, may in process of Time be discovered also in the other.

Could we view these *Sea-Productions* in their several Actions of Life, as we do the *Polypes* in our Glasses, stretching out and pulling in their Arms, and seizing their Prey, the Similitude between them would, I make no doubt, be still more remarkable than it appears in these dried Ones.

C H A P. VI.

Of the POLYPE's Stomach.

THE Stomach of a *Polype* is that Place which receives its Food : and the Passage thereto is an Opening between the Arms, which, therefore, I shall term the Mouth. This Mouth can open, occasionally, extremely wide, and as well as the Stomach is perfectly suited to so voracious an Animal, for the swallowing and digesting Worms and other Creatures much larger than itself.

When an Animal is reported to swallow Creatures larger than its own Size, an Explanation is highly necessary, or else, however true the Fact may be, one can scarce expect it should obtain Credit. In order therefore to solve this Difficulty, it must be remembered, that every Part, every Fibre of this Animal, is capable of very great Extension : and by this means it is, that the Body and Stomach admit of being stretched out to such a wonderful Degree, as really to receive and contain a Quantity whose Bulk is more than that of the whole *Polype* was before* :

* Something of the like Kind may be observed in Snakes and Lizards, when they swallow large Frogs, Toads, &c.
after

after which it necessarily appears proportionably swell'd and enlarg'd.

This convenient Stomach is also as ready to digest as to receive its Food: for after, a few Hours, the Pellicles or Skins of the Creatures devoured are discharged again by the Mouth, wholly divested of all their Juices, and as thin as the finest Cobweb; and then the Stomach contracts in its Diameter, but extends in Length, the *Polype* spreads out its Arms, and waits for another Meal.

The Bottom of the Stomach is semi-circular, and seems to terminate at the Beginning of what I call the Tail, where it is likely it may have some Opening into the strait Gut that passes to the *Anus*; by which, as I before took notice, Part of the less gross Nourishment may probably be discharged. I have frequently seen a Worm, presently after it was swallowed, and before Digestion, lying double at the Bottom of the Stomach, and thereby shewing how far it reaches, as in the Figure.



Though I have frequently made Attempts, I have not yet been able to lay open the Body of a *Polype* in Water, so well as to distinguish its internal Structure; and, when out of Water, it contracts into a mere Lump of Jelly, without any Form or Parts, and is altogether unmanageable: I shall not, therefore, pretend to give any Account of what is within it, farther than to observe, that in one or two I have turned, the Inside seemed much whiter, more spongy, loose, and uneven than the Out.



C H A P. VII.

The POLYPE's natural Way of producing its Young.

POLYPE S produce their young Ones in a Manner very different from the common Way of all other Creatures yet known. There is no Appearance of Copulation, nor any Distinction of Sex amongst them. Every one of them is prolific, and that as much if kept entirely apart from all others, as when several abide together.

The young One issues from the Side of its Parent, in the Form of a very small Pimple or Protuberance, not bigger than the Point of a Pin; which lengthens and enlarges every Hour; in a Day or two puts forth Arms, becomes a perfect, though small *Polype*, and separates from its Parent.

All this is performed much sooner in hot Weather than in cold: and after this Manner four or five are frequently protruded, and seen hanging to the Body of the old One all at the same Time: These too as they drop off are soon succeeded by more. And what is most extraordinary, the young Ones themselves often breed others, and those others sometimes push out a third or fourth Generation before the first fall off from the original Parent.

At the Beginning, the young ones have no Arms, and the Head-Part, then, appears like a round bald Knob; but in a little while two Arms push themselves out, which not long after are followed by two more, and those in a short Time by others, till their whole Number is compleated in the order taken notice of under my Description of the Arms.

No sooner is a young One furnished with Arms, than it seizes and devours Worms with all possible Eagerness: nor is it an unusual Thing to behold the young One and the old One struggling for, and gorging different Ends of the same Worm together. Before the Arms come out, and even some time afterwards, a Communication continues between the Bodies of the Old and Young, as appears beyond Dispute by the swelling of either when the other is fed. But a little before the young One separates, when its Tail-End begins to look white, transparent, and slender, the Passage between them, I believe, is closed. And when the young One comes away, there remains not the least Mark where it had been protruded.

After a young *Polype* once gets all its Arms, it alters indeed in Size, but neither appears to shift its Skin, or undergoe any of the Changes most other Insects do.

I have seen young Ones pushed out from most Parts of the Body, but seldom very
near

near the Arms, or below the upper Part of the Tail. The most prolific Place of all seems to be at, and a little above, what I call the Bottom of the Stomach: all round which Part they sometimes hang in Clusters.

Two young Ones, now and then, come out of this Place so near together, that, even after their dropping off, they adhere to each other by the Tails; and being thereby unable to fix themselves to any thing, are forced to lye at the Bottom of the Vessel, where extending in a contrary Direction, they appear as one *Polype* with a Head at each Extremity: and they sometimes stick thus together several Days before they separate. I had two, some Time ago, which continued thus above a Fortnight, and were stretched out more than three Inches long. I have also known one of these two-headed *Polypes*, or *Amphisbænæ*, (if I may so call them) produced by the pushing out of a young one in the same Line with the Body, at the Place where a Tail has been cut off: And this Appearance, had I not considered the Case, might have so far deceived me, as to make me imagine a Head was produced where the Tail had been cut off.

These Creatures in warm Weather push out their young Ones so surprizingly fast, and multiply to such a Degree, that, I believe, the Descendants of a single *Polype* may, in

one Summer, amount to many Thousands. But, at all Seasons, a great deal of their Increase, in Number as well as Bigness, depends on their being well fed, and kept clean.

A great deal of Pains has been taken by my worthy and ingenious Friend, the Reverend Mr. HENRY MILES, of *Tooting* in *Surry*, F. R. S. to observe carefully the Progress of this Creature's natural Increase, in order to make some Calculation of the Numbers produced thereby within a certain Time. And as he has been so obliging to communicate to me the Result of this curious Experiment, in a Letter, dated the fifth Day of *September*, 1743, I shall now, Sir, have the Honour of laying it before you in his own Words.

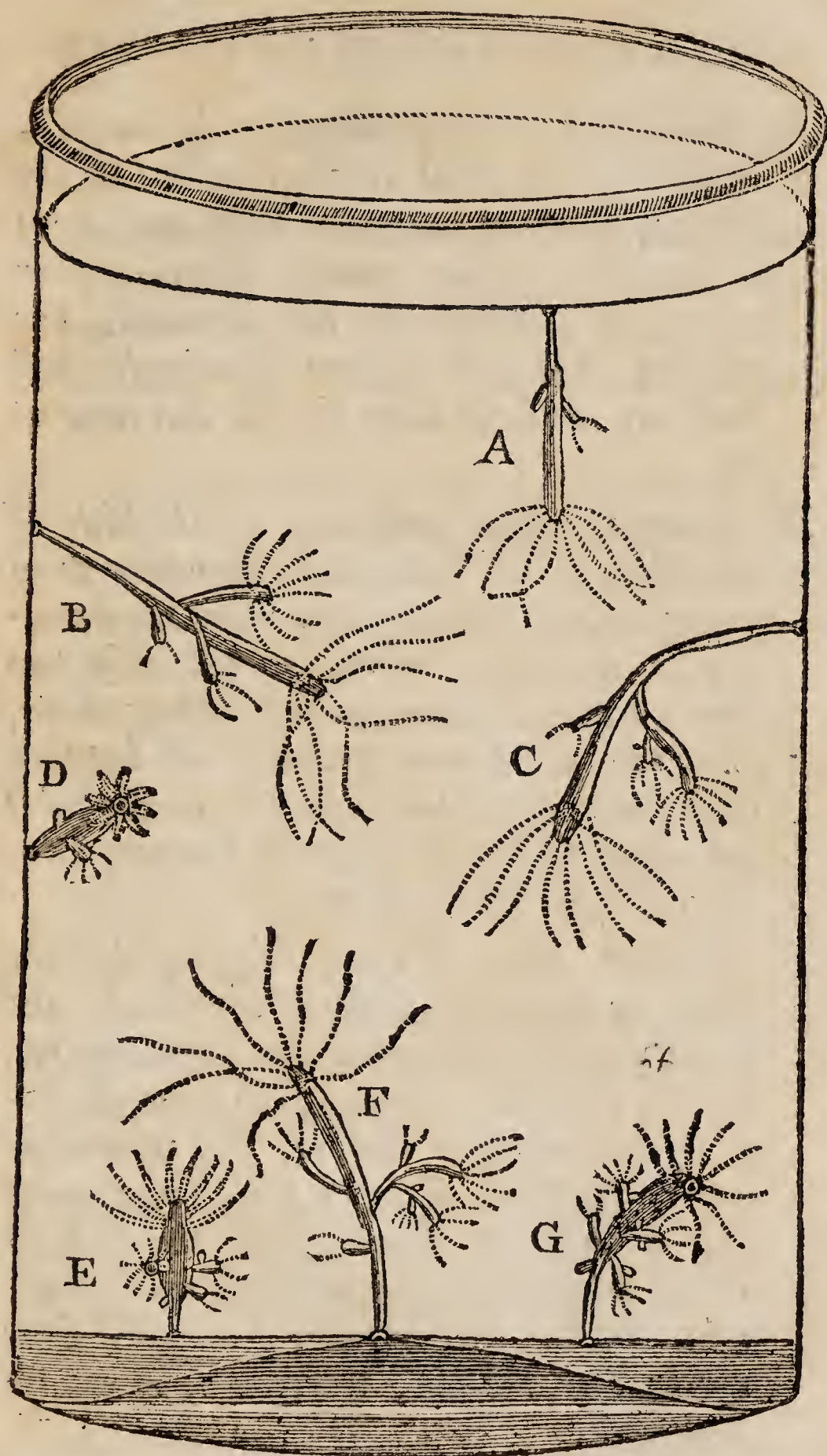
“ The single *Polype*, says he, which was
 “ put into a Glass by itself *July* 12. with two
 “ Intentions, *viz.* that I might learn how
 “ long-liv'd the Creature is, and at what
 “ Rate it produces Branchers, is still alive :
 “ and goes on to produce at least five in a
 “ Week, one Week with another. But
 “ because this *Polype* had the Appearance of
 “ a young One on it, when I first set it apart,
 “ (which young One came off in three Days)
 “ I was willing to make Trial how long it
 “ would be before a separated young One
 “ might

“ might be expected, provided the old One
 “ had no Appearance at all of any one
 “ thrusting out when it was set apart, but
 “ was only of a moderate Growth. Ac-
 “ cordingly I took such an One, a Branch-
 “ er from the first, and put it into a Glas
 “ by itself, *July 23*. And in a Week’s Time
 “ it produced One; and since that produces
 “ at the Rate I mentioned before, five in a
 “ Week. I was pleased to find, that the
 “ two single Ones so exactly agreed in the
 “ Number of their Productions, in the same
 “ Space of Time; and as they continue to
 “ do so, I suppose this may be allowed a
 “ Sort of Standard. Permit me to observe
 “ by the Way, that These are fed and shifted
 “ but once a Day with the others ;but I must
 “ add, that they sometimes were gratified
 “ with more Worms than One : for being in
 “ single Glasses they are much more vora-
 “ cious than those are which live in Num-
 “ bers together. The fewer together, the
 “ better they feed.

“ Soon after I had separated the Second, I
 “ sent to a Friend, well-skilled in Figures,
 “ to desire him to make a Computation of
 “ the Number which a single *Polype* would
 “ produce in a Year’s Time, if it could be
 “ done: and on this moderate Supposition,
 “ that a Week’s Time being allowed for
 “ every Brancher that is separated, e’re it be-
 “ gins to produce : it be supposed, afterwards,

“ to produce One in three Days. But he
“ informs me, there is no Rule by which
“ such Computation can be made; that it
“ is next to impossible to do it, without
“ spending more Time than he can spare;
“ and after all, Mistakes may probably arise
“ in such Multitudes of Figures as are necessary. However, he tells me, that he
“ went so far as to calculate the Number of
“ the second Generation, which amounts to
“ Eleven Thousand and odd. What then
“ must the whole amount to !”

The Appearance the *Polypes* make with their young Ones hanging about them, and all the other Particulars of their Production, will, I hope, be understood by the following Figures, drawn from a Glass of them which now stands before me.



AN EXPLANATION of the FIGURES.

- A. Represents a Polype hanging by an Air-Bubble at its Tail to the Surface of the Water, and extending its Body and Arms downwards. Two young Ones appear near the Bottom of the Stomach, one whereof has two Arms seemingly just come out, and the other as yet has none at all.
- B. A large Polype adhering to the Side of the Glass by its Tail, and extending as in quest of Prey. Three young Ones are hanging to it: One having as yet only two short Arms; another with two long Arms, and two short ones growing up between them; and the Third, which is probably just ready to drop off from its Parent, having eight handsome Arms.
- C. Another large Polype hanging by the Tail, on the other Side of the Glass, and stretch'ing itself downwards. A young One, having two short Arms, issues from its Body; and opposite thereto, but somewhat nearer the Tail, hangs a full-grown young One with seven Arms; from the Side of which hangs down another with four Arms; and another still appears protruded from the Side of the last, whereon no Arms are seen.

D. A

- D. *A Polype in its contracted State, fastned to the Side of the Glass by its Tail, and having two young Ones : the biggest with six Arms, and the least without any.*
- E. *A Polype somewhat but not wholly contracted, standing erect upon its Tail-End at the Bottom of the Vessel. Six young Ones of different Age and Size hang round it.*
- F. *A large extended Polype, raised upon its Tail and brandishing its Arms at the Bottom of the Water. A remarkable full-grown young One continues hanging to it : producing from its own Body one little young One having two just peeping Arms; and also a larger with four Arms, by which two more Young, one with four Arms, the other without any, are protruded. On the Parent Polype are also two more young Ones.*
- G. *A Polype about half-contracted, whereon a Cluster of nine young Ones of various Growth are shewn.*

As it will be no long Digression, I beg leave to mention here another Creature, whose Way of bringing its young Ones into the World, is different from the common Course of Nature. What I mean is, the Toad or Frog of Surinam, which MERIAN gives

gives a Figure and some Description of among her curious Drawings of the Animals of that Country.

The young Ones of this Toad are protruded out of its Back in their perfect Shape, after having been hatched from Eggs contained in certain Cells within the Skin.

Dr. RUISCH, in his Account of the Rarities in his own *Musæum*, gives us two Figures of this Animal, which, he says, is like a Toad, and that many Eggs appear on the Back thereof, each inclosed in its particular little Cell or *Uterus*, out of which it at last bursts forth.

He tells us farther, that upon opening it, to see whether the Eggs did not come primarily from the *Abdomen*, and were only hatched in and pushed out of the Back, the Case appeared to be the quite contrary; for he could not discover any Communication between the Eggs and the internal Parts of the *Abdomen*; but he found the Skin of the Back full of little Cells or *Uteri*, each containing an Egg, under a hardish *Operculum*, which being removed, it lay naked to the Eye*.

Mr. BRADLEY says, he has seen this Creature in the Cabinets of Sir HANS SLOANE, of Mr. VINCENT of *Haerlem*,

* Vide RUISCH. *Thesaur: Animal.* p. 19.

Dr. RUISCH, and Mr. SEBA of *Amsterdam*, and has observed it in three different States. In the first, the Pores of the Back Skin were all closed; excepting three or four, which began to be forced open by the Eggs lodged in Cells below them. In the second State, all the Pores in the Skin of the Back were so much opened, that he could plainly discern the Points of the Eggs within them. And in the third, (which he gives a Picture of) young Ones were perfectly formed in all the Cells of the Back †.

I have had the Pleasure, SIR, on this Occasion, to examine, in your Company, one of these Animals, which is very well preserved in Spirits, in the Repository of the *Royal Society*, and was given by his Grace the Duke of RICHMOND.—It much resembles a very large Toad, being of the same Colour, and having little Protuberances like Pins Heads scattered over its Skin in the Manner our Toads have: but the Form of its Head differs from those of *Europe*. On its Back, reaching from near the Shoulders to within a little of the *Anus*, are about two hundred circular Appearances, like dry dead flat Scabs, about half the Breadth of a Silver Penny, disposed near one another in a some-

† Vide BRADLEY'S *Works of Nature*, p. 126.

what regular Order, and forming all together a Sort of oval Figure. These are the *Opercula*, or Coverings of the little Cells, spoken of by RUISCH, and called Pores by BRADLEY.----Perfectly formed young Ones are seen issuing from two of these Cells: One has its Head and two Fore-Legs protruded, the hinder Parts remaining in the Cell; and the other thrusts out its two Hind-Legs, the Body and Head being left behind. A single Leg is likewise pushing out from a third Cell; but all the rest seem closely covered with their *Opercula*. The young Ones are much blacker than their Parent.

I am not suggesting any Resemblance between the Production of this Animal and that of the *Polype*, but instance it as another Extraordinary of Nature: and wish we could learn a little more of its *Coitus* and Organs of Generation, which in so large a Creature might be easily enough discovered.

A farther Example of the various Ways Providence has allotted for the Production of living Creatures, I lately had the Honour of being shewn by you, who are, I believe, the first Discoverer of it; and whom I have always found so willing to communicate every thing which may tend to the Improvement of natural Knowledge, that I assure myself of your Pardon for laying it before the Publick.

In the Months of *April* and *May* Abundance of little brownish Eggs, about the Size of middling Pins Heads, and having each a Shell, were found in the Mud, amongst the little red Worms wherewith the *Polypes* are fed. These Eggs you examined by the Microscope, which plainly discovered living Worms moving within each Shell. But the most surprizing Part of the Story is, that on breaking any of these Shells with the Point of a Needle, not only a single Worm, as might be expected, but four, five or six, nay, sometimes eight or nine minute, but perfect Worms, burst out and crawled about nimbly: and it appeared, that each of these little Worms had been enclosed in its own proper Integument within the Shell, out of which it forced its Way at the Time the Shell was broke. These Integuments are extremely thin and transparent, and may be distinguished floating in the Water they are viewed in, or hanging about the Worms, which cannot sometimes, immediately, get from them.

Here we find Eggs inclosed in Eggs, and several young Animals issuing from one Egg; Circumstances very wonderful, and what I do not remember to have met with any Account of before among the Works of Nature.

C H A P VIII.

Where Polypes are to be sought for, and how to find them. The Manner of seizing their Prey described. Their Diseases and Cures. How to feed, clean and manage them at all Seasons. How they are affected by Air, Heat, Light, Motion. The Way of drying and preparing them for the Microscope.

THE Waters where *Polypes* abound most, are not, as I am informed, such as be quite stagnant, nor those on the contrary, that have a strong or rapid Stream; but such as glide along with a gentle and slow Motion; where they may adhere to Stones, Sticks, or Plants, without the Risque of being wash'd away; and may have a Supply of Provision brought to them by the kindly Current of the Water. In Places like these, there can be no doubt, that they catch and devour many Sorts of small Insects, wherewith the Waters are peopled: but mine, that are kept in Glasses, (as I live in *London*, and therefore am unable to procure them such Variety,) have been forced to feed on a kind of small red Water-Worms, found plentifully in the Mud of the River *Thames**, and likewise, as I am

* When the Tide is out, these Worms rise in such Abundance on the Surface of the Mud, that it appears of a red Colour.

told, in the Mud of many Ponds and Ditches. They have thriven however very well on these Worms, and their manner of seizing These, is sufficient to let us know how capable they are of doing the same thing by other Creatures larger than themselves; for the Worms I speak of have not only a great deal of Strength and Agility, but are many of them two or three Inches long, and consequently as big as several *Polypes*. Notwithstanding which, they scarce ever fail to kill, and very seldom to gorge them entirely, unless they happen to be uncommonly large: in which Case they swallow as much as their little Bodies can possibly contain, and leave the Residue hanging out of their Mouths.

When a *Polype* stands erect on the Bottom of the Glass, or hanging to the Side thereof, with its Body and Arms extended, as in the Figure, it is as vigilant as a Spider in the Centre of its Web, fully intent on Prey; and will seize a Worm with as much Eagerness as a Cat catches a Mouse.



I have

I have often seen them thus situated, extending and waving their Arms in the Water, several Inches long, and so exquisitely slender as not to exceed the Thickness of the finest Cobweb: yet their Sense of Feeling is so delicate, that if a Worm touches even the utmost Extremity of these very slender Arms, they immediately lay hold of it, and contracting themselves to about the middle Length between their utmost Extension and Contraction, by clasping their Arms about it, they envelop and fetter it in so many Places, and to such a Degree, that notwithstanding it be much larger and seemingly stronger than they, it is soon rendered incapable of struggling to any Purpose. In this Condition the *Polype* lengthens out its Snout *, and bites the Worm violently on one Side, which not only gives it a great deal of Pain, as its wriggling Motion testifies, but likewise makes the Blood run out: and it continues sucking at the Wound till the internal Juices are so far extracted, that the Body of the Worm is reduced to a Size not over-large for the *Polype's* Mouth, then opening extreamly wide, to take it in double; in which Manner it is swallowed, slowly and gradually, till the whole gets down into the Stomach; where it may be discerned thro'

* Vide Page 32.

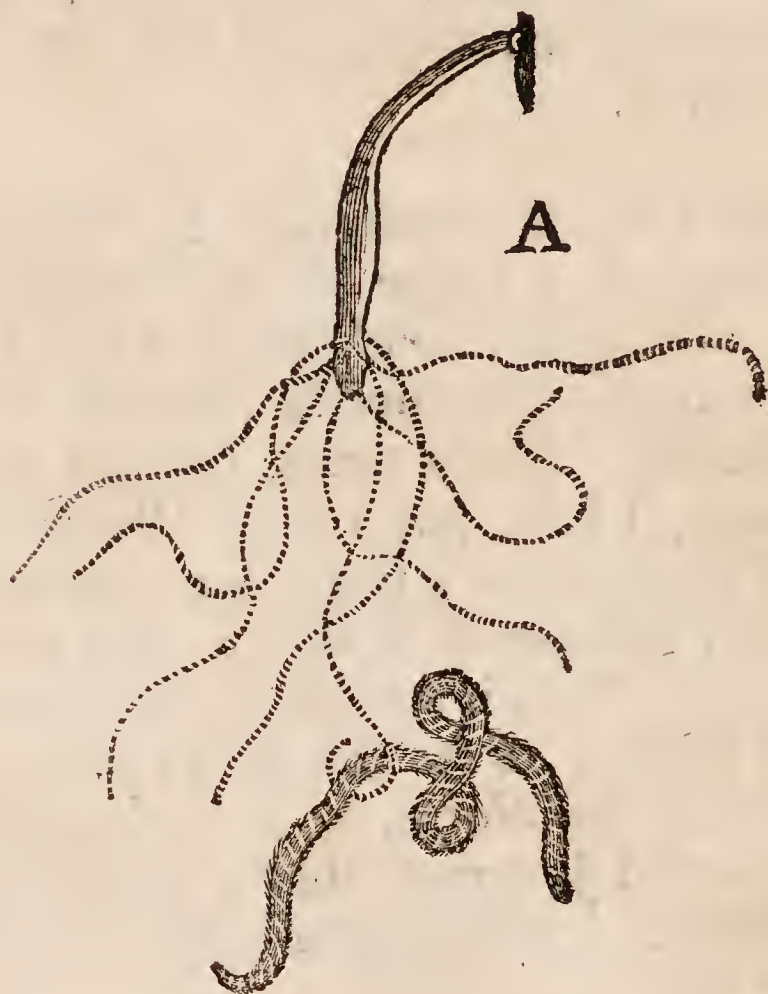
the Skin, lying folded as before described †, Page 47.

When the *Polype* is thus gorged, it remains contracted: its Arms hang down limber and motionless like wetted Threads; and it appears lazy, dull, and unactive for several Hours; till, having digested the Worm, it discharges the thin Skin or *Exuviae* thereof upwards by the Mouth; after which it is ready to eat again, catches hold of whatever touches the Arms, and will not easily part with it.

'Tis a fine Entertainment to behold the Dexterity of a *Polype* in the mastering its Prey, and observe with what Art it evades and overcomes the superior Strength or Agility thereof. Many times, by way of Experiment, I have put a large Worm to the very Extremity of a single Arm, which has instantly fastened on it with its little invisible Claspers. Then it has afforded me inexpressible Pleasure, to see the *Polype* poising and ballancing the Worm, with no less seeming Caution and Judgment than a skilfull Angler shews when he perceives a heavy Fish at the

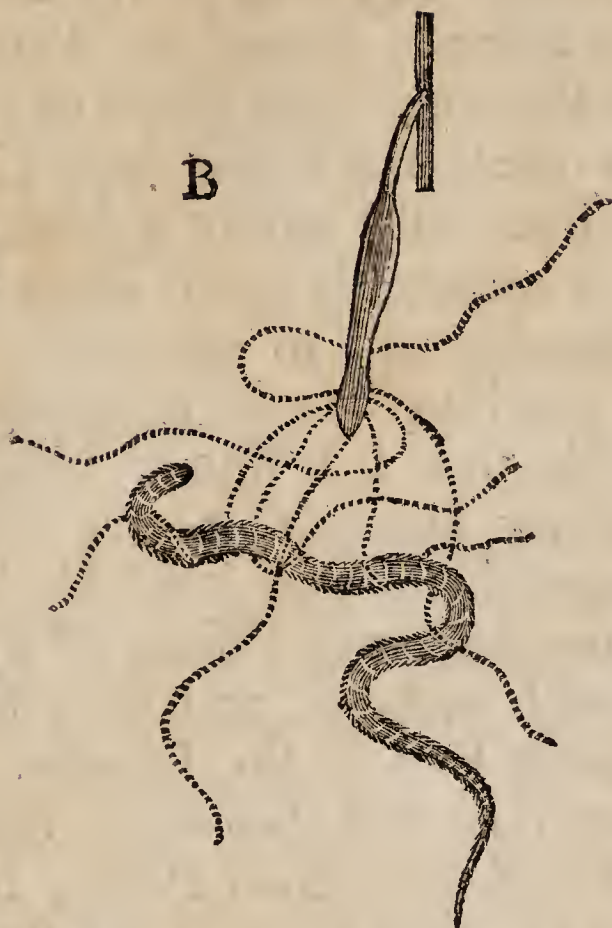
† The Blood of the Worm may be seen, very plainly, passing into the *Polype's* Stomach, causing a Redness and Fullness there; and the Worm itself, even from End to End becoming pale, and almost colourless, before the *Polype* begins to swallow it.

End of a single Hair-Line, and fears it should break away. Contracting the Arm that holds it, by very slow Degrees, he brings it within the Reach of his other Arms, which eagerly clasping round it, and the Danger of losing it being over, all the former Caution and Gentleness is laid aside, and it is pulled to the *Polype's* Mouth with a surprizing Violence.



A. Represents a Polype hanging by the Tail, seizing and managing a large Worm with a single Arm.

B. Shews



B. Shews the same Polype folding its other Arms about the Worm, drawing it to its Mouth, and lengthening out its Snout to bite it.

The Worm, on its Part, is not without a Knowledge of its Enemy, or a proper Sagacity to endeavour its own Preservation and Deliverance. The Minute it touches a *Polype's* Arm, it starts away with as much seeming Horror as a Man would do that should tread upon a Snake or some other dreadful Creature. But if a Worm be thrown into the Midst of a *Polype's* Arms, it will often lye motionless, as though it were sensible *Polypes* would not meddle with dead Worms;

(which indeed they will not:) and seems sometimes so far to deceive the *Polype*, that it neither seizes nor takes notice of it whilst it remains quiet: but as that cannot be long, when it finds itself under a Necessity of moving, it commonly exerts all its Strength in a sudden Struggle to get away; though rarely to any Purpose: for no sooner does it begin to stir, than it is sure of being seized, and whatever Strength it may exert, the *Polype* very seldom quits its Hold, but cunningly gives way to its Efforts till it can entangle it with its Arms, and by a fatal Bite put a speedy End to the Dispute. However I have now and then seen a very strong Worm, seized by a small *Polype*, break off all the *Polype's* Arms by its violent struggling, and so make its Escape.

Two or three *Polypes* often catch hold on different Parts of the same Worm, and each swallows down as much as he can get, which obliges them to continue for some Hours with their Mouths closely conjoined together: for they cannot separate, till the Worm in their Stomachs is digested, and thrown out again at their Mouths.

I have many times remark'd, when four or five *Polypes* have been in the same Glass, that upon giving a Worm to One, all the rest, presently afterwards, have extended their Arms and Bodies, (though before they

were contracted) as if they knew that Food was not far off: but whether excited thereto by Seeing or Smelling, or some other way of Information, I shall not pretend to guess: no more than I shall to determine, whether it is Light or Heat, or some other Cause, that induces them to extend their Bodies and spread their Arms, when brought out of a dark Place into a light one, or placed near a Candle, as they are almost constantly found to do. Upon bringing a Worm towards them, I have likewise observed often, that they lengthen out and stretch themselves forwards as much as possible, before ever it has touched their Arms. And, frequently, upon dropping Worms in the Glasses, tho' at a Distance from them, I have found 'em devoured, after a very little while; but whether the Worms moved to them, or they to the Worms, I cannot take upon me to affirm.

Mr. TREMBLEY feeds his *Polypes* with what he calls the *Pucerons d'Eau*, which I take to be our *Pulices aquatici*. In the Letter before mentioned from the Duke of RICHMOND, his Grace says, that upon Mr. TREMBLEY's flinging amongst his *Polypes* some of these nimble Animals, he saw the *Polypes*, both old and young, stretching out their Arms, catching and devouring them with great Eagerness: and that he could tell what Number of them each *Polype* had eat, by being able to discern the black Eyes of

the *Pucerons* through the Skin of the *Polype*, and that in the Stomach of some he could discover five or six.

These *Pulices aquatici* are plenty enough in many Ditches in the Country; and it is not improbable that in the same Ditches *Polypes* may be also found: the Way of knowing which is, to take out gently the Roots or Stalks of Water-Plants, Leaves, Sticks, Stones, or any thing else that lies below the Surface: and putting them in a Glass Vessel full of Water, if there are any *Polypes* you will soon perceive them adhering by their Tails, and waving about their Arms. For when their Tails are fastned to something, as they most commonly are, they do not easily quit their Hold when in the Water, nor drop off, tho' what they stick to be taken out of it: so that Thousands of *Polypes* may be hanging to the Weeds, Stones, &c. every where in the Water, and yet by meer dipping you may not perhaps find one. The Want of knowing this has been, I believe, the Reason of many Disappointments in searching after them: for as they do not swim, and are very rarely loose in the Water, taking up Water only can signify but little, unless by some violent Motion or other Means their Tails could be disengaged; and even then, except they could be got up instantly, they would sink to the Bottom, and frustrate all our Pains.

It is impossible to make such Observations on these Creatures, kept in small Glasses, and
 3 within

within Doors, as would naturally present, could we bring them under Notice in the open Waters where they breed, and are living in their own Way. For several Months past, I have daily, with great Attention, been viewing and considering them as to their Forms, Motions, Contractions, Extensions, Manner of Feeding and Increase, both with and without the Microscope; which has enabled me to put these Remarks together: but I am sufficiently convinced how defective they must be, for want of seeing the Animal in its more natural Way: and, therefore, how liable I am to be mistaken in many of my Conjectures.

When they raise themselves upright at the Bottom of the Vessel, or adhere to the Side thereof playing their Arms, they seem in better Health than if they lye along at the Bottom of the Water, without fixing their Tails: though sometimes single *Polypes* that are very large, and frequently such as have many young Ones hanging about them, will lye so for many Days together, and yet seem well enough. They often get to the Surface of the Water, by crawling up the Sides of the Glass, and there hang, either by the Arms or Tail, or lay themselves along and float. But in either Condition they appear incapable of sinking: for if you plunge them in the Water, unless they are held down for a little while, they will instantly be at Top again. I can't be

sure they crawl up the Sides of the Vessel in quest of Food; but those I have observed hanging in the Manner abovementioned, have always been such as I had Reason to imagine might be hungry, from not having eat for some Time before. I likewise find them, when so suspended, very ready to seize whatever comes within their Reach, clasping with their Arms the Quill I manage them with so firmly, that it is difficult to get it from them, and a Worm that comes near them is certain not to escape. After being fed, they easily sink to the Bottom, and continue there: but those I have put down without giving them Food, I have commonly, in an Hour or two, found again at the Surface. Perhaps, when empty, the Air may insinuate, and render them specifically lighter than the Water.

Howeyer hungry they are, they never prey on one another; but, on the contrary, if several are in a Glass they seem to chuse being near one another. I have often put a little *Polype* to a large One, that has been fully extended to seize whatever should come within its Reach, and have constantly found, that it received it with great Gentleness, and as if it were afraid to hurt it.

Some Gentlemen have found their *Polypes* quite dissolved in their Glasses, by not renewing

newing of the Water sufficiently often: which is not much to be wondered at, since Fish will be the same in some Degree; that is, the Fins and Tail will mortify, and dissolve into a slimy Substance, by being kept in stale Water: for stagnating Water grows putrid, and becomes a Kind of *Menstruum* to all animal Substances infused therein; and the Water with these Creatures is rendered much sooner so, by the *Fæces* they disgorge into it, converted into a Kind of Slime, fatal to them if not cleared away: the *Mucus* from their own Bodies contributes likewise greatly thereto.

In shifting the Water, it is not enough to pour it off, but they must all be taken out, and the Vessel rubbed clean from the slimy Sediment adhering to the Bottom or Sides: otherwise the Mischief will not be effectually prevented. My Way has always been, every two Days, to loosen their Tails from the Sides or Bottom of the Glass; then shaking the Water gently round, I pour it and them into a *China* Basin, whilst I rub and cleanse the Glass perfectly; after which filling it with fresh Water, I take them up one by one, with a Quill cut Scoop Fashion, and replace them in the Glass. This may be thought a little troublesome, but hereby I have been so fortunate as scarce to lose a single *Polype*.

When

When taken up with a Quill, they sometimes cling to it by the Arms in such a Manner as not easily to be disengaged: the Way, then, is to let the Quill remain a Minute or two in the Water, till they quit their Hold, or you'll be in Danger of breaking their Arms off.

When an Arm is broke, it is quickly again repaired, but there appears for some Days a Swelling or Callosity at the Place, which however wears away in Time.

On putting them into fresh Water, they likewise often fasten by the Arms instead of the Tail to the Side or Bottom of the Glass, and continue for some time in a very odd Posture, so fixt, there is no removing them without Danger of injuring their Arms; therefore it should not be attempted, for they will soon set themselves right again.

Care must be taken, that the Water given them be of a proper kind: for all Waters are not agreeable to them, and some will destroy them quite. What is taken up, clear, out of some Ditch or Pond, the Water of a River, or any other very soft Water, may be put to them with Safety; but that which comes from a Spring, or Pump, or is in its own Nature hard or sharp, gives them Uneasiness as soon as they come into it, prevents their thriving, makes their Arms fall off, and
(as

(as I have been informed) kills them in a few Days.

When they find themselves in such Water, their Arms and Bodies instantly contract as much as possibly they can; they fasten not by the Tail, or play their Arms, but continue cramp'd, or as it were squeez'd together: appear shrivell'd, white and lifeless, refuse Food, and dwindle away to nothing.

On perceiving this, the Water should be changed instantly; and even though it is so, they don't sometimes recover themselves in several Days.

But if the Water put to them is what they like, though, perhaps, the Motion occasions them to contract at first, they'll quickly fasten their Tails to the Sides or Bottom of the Vessel, extend their Bodies and Arms, play themselves about vigorously, appear healthful and lively, and catch a Worm as soon as it comes within their Reach.

The Water of the *New-River* is what I give to mine: it agrees with them mighty well, and I am told the *Thames* Water does the same. But either of these Waters may be rendered much better for them, if it be let stand for a Day or two, till the Foulness subsides, and it becomes perfectly fine and limpid. For these Creatures love Cleanliness exceedingly; and if Water be thus prepared, they not only seem delighted with and thrive much

much better in it, but you may view them with more Pleasure, and have not occasion to shift it quite so often.

It is very common soon after their Water is changed, to see them disgorge into it whatever was in their Stomachs: but they do this more immediately, if it be Pump, or Spring-Water, or of a Kind they do not like.

A great Inconvenience arises from Multitudes of minute Water Insects, which, like Lice, crawl about the Body, Head, and Arms of the *Polype*, and seem to torment it exceedingly. Renewing the Water frequently is some Relief for this Evil, but the most effectual Way is to rub them off in clean Water with a soft Hair-Pencil, then take them out, and put them into other Water, and repeat this Operation two or three times. They may thus be made very easy for a while; but with all my Care, I could never preserve them long free from these vexatious Vermin.

These Lice are so numerous, and of so large a Size in respect to the *Polype*, that (as any Body will be sensible on viewing them through a Microscope) they must give it great Uneasiness: for they seem as big in comparison as *Beetles* would be to Us, and by crawling all over its Body and along its Arms, make it writhe and twist about, and shift

shift its Posture continually, and seem to torment it in such a Manner as one cannot see without pitying the poor unhappy Sufferer.

If the Water wherein *Polypes* are kept be not often shifted, the Lice increase so prodigiously upon them, as quite to cover their Bodies, eat off their Arms, and devour them by little and little; which, I believe, has been the Fate of many that were thought to have been dissolved.

The Figure and farther Description of these Lice may be seen in the third of the following Experiments.

My *Polypes* were kept, at first, in small Glass Vessels, containing about two Ounces of Water each, with Mouths very near as wide as their whole Diameter. Such Glasses hold five or six of them very conveniently, admit their being put in or taken out without Danger of Injury, and are easily clean'd and replenish'd with fresh Water. But when the Creatures multiplied, by Cutting and otherwise, to several Hundreds, I procured some larger Glasses, of nearly the same Form, containing better than three Quarts of Water, and capable of holding an hundred and fifty or two hundred *Polypes*. In a Glass of this Size the Water need not be renewed so frequently, especially if the *Fæces* be taken out from time to time with the feathered
End

End of a Quill, to which it very readily adheres. It is pleasant enough to observe them in such a Vessel, hanging from its Sides, or erecting themselves at the Bottom, all extending their Arms at the same time, and so occupying every Place, that as soon as a Worm is thrown in, three or four of them perhaps lay hold of it. This saves the Trouble of feeding each particularly, as in the smaller Glasses; for here I only fling in Worms, and let them take their Chance: but then it has this Disadvantage, that all of them are not constantly fed, nor any of them so often as in the smaller Glasses; which prevents their growing large. And therefore I still keep a few (as well as all under Experiment) in my little Glasses, where I feed them as often as they like to eat, and by so doing have some whose Bodies are very near three Inches in Length, when they extend themselves: which, if I may guess by what I have seen of Mr. TREMBLEY's Observations, is longer than any of his, that are kept in very large Vessels: and perhaps much longer than they would ever grow even in their own Waters. These very large *Polypes* seldom fasten to the Sides of the Vessel, or raise themselves much from the Bottom; but lye along there, oppressed as it were with their own Bigness, and extending their Arms but little. Their Form is also commonly irregular. The largest I have seen have been
produced

produced by Cutting; or, to explain myself better, the Tail-Ends of *Polypes* that were cut in two, transversly, are become those very large Ones I have been mentioning. The Head-Ends grow large also, but not in the same Proportion.

The best Way of feeding them is, to suit the Worms to the Bigness of the *Polypes*; for though the least *Polype* will fasten on and kill a large Worm, it is unable to swallow it all, and what remains, hanging from its Mouth, serves only to foul and corrupt the Water the sooner. If therefore a whole Worm seems too much, divide it between two. It is surprizing to behold how soon a *Polype* kills a vigorous nimble Worm: except by crushing, no way can put it to Death more speedily. But there is no Certainty what Kind of Weapons this is effected by, though probably it may be armed with sharp Teeth, as has before been mentioned.

The Worms they are fed with should be well cleansed from the Mud, and have fresh Water often given them, or they will sicken, grow white, and mortify at the Tail-End; in which distempered Condition they prove poisonous to the *Polypes*, and if eaten, will kill them. 'Tis best to put the Worms into clean Water every Time you feed them.

Polypes seem not to want much Air: Numbers of them were brought from *Holland* in Glas-Vessels closely stopp'd; and I have known them carried about (in the Pocket) whole Days, in a Phial corked close, without receiving any Harm. Those in my own little Glasses have constantly been locked up in a Book-Case, and yet have thriven much better than others kept more open: which perhaps is owing to the kindly Effect Heat has on them, as plainly appears by their being restored much quicker after Cutting, and producing young Ones in greatest Abundance when the Weather is at the hottest.

In Summer Time, however, they may be kept in any Sort of Vessels, or in any Place; but when the Weather is cold, small Glasses covered with Paper, having only a few Pin-Holes pricked through it, and placed in a warm Closet or Cabinet, are best: and in a frosty Season proper Care must be taken to prevent their being frozen. They remain commonly at such Times contracted, unless when brought to a warmer Air: require cleaning and feeding much seldomer: appear more sluggish and unactive, and breed but seldom: and as all their Operations are much slower, their Reproduction, after Cutting, takes up then likewise a much longer Time.

It

It may seem extraordinary to talk of any Creature's being affected by Light, in whom no Eyes are to be found, and yet this Animal plainly appears to be so; for after standing a short Time in the dark, it is usually found contracted and without Motion: and when brought out of a dark Place into the Light, it scarce ever fails to extend its Body and Arms, and play them about briskly.

When first I observed this, I apprehended, that as my Glasses were shut up in a close Book-Case, the Change of Air and not of Light might be the Occasion of it, and therefore put a Number of them in an open Vessel, on the Top of a Cabinet; where (though they were not wholly in the dark) I found them most commonly contracted: and when I brought them to a better Light they constantly stretched themselves out. I might add, that when they approach a Candle they always do the same; but, perhaps, it will be thence suggested, that Heat may be supposed to affect them rather than Light.

I shall not at all Dispute whether of the two it is: but be it one or the other, it seems an undeniable Evidence, that this Creature is possessed of a most exquisite Sense of Feeling.

However, Mr. TREMBLEY has made an Experiment with the little green *Polypes*, which appears to be conclusive. He fitted a cylindrical Glass, wherein he kept a Num-

ber of these, with a Coat of thick Paper ; out of which Paper he cut, on one Side, the Figure of a Chevron. Then covering his Glass with it, all Light was excluded, but what came through the said Chevron. The Consequence was, that all the *Polypes* in the Glass came and placed themselves within this Figure : and whenever he turned it about, as he did several Times, they constantly removed their Quarters, and in a Day or two would every one of them be ranged in the Chevron on the other Side of the Glass.

Some Months ago, carrying a few *Polypes* about a Mile, in a Hackney Coach, in a Phial about half full of Water ; the Jolting of the Coach, upon the Stones, dashed the Water, continually, with so much Force against them, that when I came to my Journey's End, I found their Arms all broken off, and their Bodies much contracted, white, and motionless: and the Gentleman with whom I left them, told me, they did not recover, but seemed to dissolve away.

As other People may possibly have met with the like Accident, without conceiving the Cause of it, I just mention this Case for their Information, and, by way of Caution, never to carry these Insects on Horseback, or in a Coach, without quite filling the Vessel they are put into with Water ; that it may thereby be prevented from dashing so violently against them. How

Effects of their Eating, or Fasting. 83

How long the natural Life of this Creature may be, I cannot pretend to say, having as yet had none that have died with me *: nor am I able to tell how long it can live without Food; though probably it may be able so to do for some Weeks or Months. But of this I am certain, that it will gladly eat two or three Times a Day, in warm Weather, if it can get Worms so often; and, when it is fed frequently, will grow large, and produce young Ones in Abundance; whereas such as are kept long fasting, lose all their Colour and Substance, are very little prolific, and dwindle away to nothing.---When hungry and empty, they appear lank, white and transparent; when full, brownish or reddish, from the Colour of the Food within them: and extend themselves much longer when hungry, than when full.

'Tis of Consequence to take notice, once for all, that the Form and Circumstances of this little Animal, and much the greatest Part of what I have related concerning it, cannot be perceived or judged of without the Assistance of good Glasses, and proper Conveniencies for placing it in Water, in

* Mr. MILES assures me, he has sometimes observed a *Polype*, adhering by its Tail to the Glass, in the usual Form, and in Colour very little paler than common, with Arms visible, but not greatly extended; which, on the Touch of a Pen, has instantly dissolved into a fine Vapour in the Water.

such a commodious Manner, that it may move and exert all its Actions of Life with Ease and Freedom; and yet be seen with sufficient Distinctness. My Apparatus for this Purpose was made by Mr. CUFF in *Fleet-street*; it answers exceeding well, and is very serviceable for any other Object that requires being viewed in a Body of Water.

But it is not sufficient to examine it alive only: I have likewise killed some, dried them, and put them between Talcs in Sliders; and by so doing have had the Honour to shew you Hairs on their Arms, and some other Particulars not perceivable whilst they were living and in the Water.

Preparing them in this Manner is a little troublesome, and requires some Dexterity: but when done, they are very curious Objects for the Microscope, well deserving the Pains they cost. And as Nobody else, I believe, has got them dried in Sliders, the Way I prepare mine is at the Service of those who may be desirous to possess so fine an Object.

I chuse a *Polype* to my Mind, and put it in a small concave *Lens* with a Drop of Water; where, when it is extended and the Tail fix'd, after pouring off a little of the Water, if the Quantity seems too much, I plunge it, *Lens* and all, into Spirits of Wine, in the Bowl of a large Silver-Spoon. Hereby it is instantly killed, the Arms and Body contracting, sometimes more, sometimes less,
at

at the same Time. I then rub it gently in the Spirits with a very small soft Hair-Pencil, to clear away its Lice, which may be seen to fall off and lye dead at the Bottom of the Liquor.

Thus far the Business seems pretty easy; but all the Skill I am Master of could never enable me to take a *Polype* out of the Spirits, and extend its Body and Arms on a Talc; though I have destroyed great Numbers in attempting it. For the Parts immediately cling together, in such a Manner, that it is not possible to separate them again, without tearing them all to Pieces.

I bethought myself, therefore, of adjusting them upon the Talc whilst in the Spirits: and to effect this, I slip a Talc under the *Polype's* Body lying in the Spirits; and displaying its Arms, &c. thereon with my Pencil, by the Assistance of my Nippers I lift the Talc and the *Polype* upon it gently out of the Spirits. Then holding it in my Nippers with my left Hand, I dip my Pencil in the Spirits with my Right, and therewith dispose the several Parts to my Wish as near as I am able; at the same Time wiping away the Lice with my Pencil, if any are to be seen upon the Talc.

When all the Parts are rightly extended, I lay it carefully to dry, which it does very

speedily, leaving the *Polype* sticking to the Talc in the Manner it was disposed.

The chief Difficulty now is over, but some Caution is still needful to secure it safely in a Slider: for if another Talc be laid upon it in the common Way, all our Labour will be rendered fruitless by its being broke and spoiled. To prevent this Misfortune, as soon as the Talc whereon the *Polype* sticks is let down into the Hole of a Slider, I cut three little flat Pieces of Cork, about the Bigness of Pins Heads and the Depth of the *Polype*, and gum them, in a triangular Position, partly on the Edges of the said Talc as it lies in the Hole, and partly to the Ivory Sides of the Hole itself; by which Means, the upper Talc being kept from being able to press upon the *Polype*, it may be put on, and fixed down with a Brass Ring, without any Fear of hurting it.

If you intend to dry a *Polype* in its contracted State, it may be put directly into the Spirits without using any *Lens*: but if you desire it extended, you'll find the *Lens* quite needful.

Vinegar, Water wherein Salt is dissolved, or Spirit of Wine kills a *Polype* immediately. But Spirit of Wine is fittest for this Purpose, as it gives a greater Firmness to the Parts, dries away from the Talc soonest, and leaves no Soil or Sinear behind it as the others do.

C H A P. IX.

*Of Cutting POLY P E S asunder, and their
Reproduction: with occasional Observati-
ons and Remarks.*

WE come now, SIR, to the most extraordinary Part of this Creature's History: which is, that when cut into Pieces, each Piece can repair itself and become a perfect Animal.

As I have experienced this very often, I shall here just mention my Way of performing the Operation, and add a few general Observations thereon: leaving the more remarkable Particulars to be set forth in the following Experiments.

The Instrument I cut them with is a Pair of very sharp small thin Scissars.--When I intend the Section should be across, I commonly (according to Mr. TREMBLEY'S Method) place the *Polype*, with a Drop of Water, in the Palm of my Left-Hand, and wait till it extends itself to my Wish: then slipping the Point of my Scissars underneath, I can easily divide it where I please. But if I design to cut it the long Way, which is best performed in its contracted State, I put it on a little Slip of clean white Paper in a small Drop of Water: and when by touching

I have made it contract and lie according to my Desire, I drain away the Water, whereby its upper and under Sides collapsing, it becomes spread the broad Way, and remains fixt upon the Paper; by which means, I obtain a great Advantage; for by cutting through both Paper and *Polype*, I can make the Section more steady and certain than I could otherwise do. The divided Pieces adhere to the Paper like a Jelly; and therefore I throw them instantly into Water, where in a few Minutes they fall from the Paper without any farther Trouble.

But if I want to cut a *Polype* before the Microscope, neither of the above Ways will do. I am then obliged to place it in a concave *Lens* filled with Water, and to cut it in the best Manner I can: and it is very difficult to divide it longitudinally in this Manner, though easy enough to do it the cross-way.

Though this Creature, as well as every other living Body, must undoubtedly be furnished with many Vessels, through which some Kind of Fluid, absolutely needful to its Life and Growth, constantly moves along; it must be acknowledged, that upon Cutting, not the least Effusion of Blood or *Ichor* can be perceived, even by the best Microscope. But this will seem in no wise strange, if we consider, that the whole

Polype

Polype has little or no other Colour than what it receives from the Appearance of its Food through the Skin; that its Juices are perfectly colourless; (as is the Case of several other Insects called, very improperly, *Ex-angues*, who have a circulating Fluid, though not of a red Colour:) and that an Effusion of such colourless Fluid must necessarily be undiscernable, unless its Current were so considerable as to occasion some apparent Emotion in the Water where it undergoes the Operation; which cannot be expected from the minute Vessels of so small an Animal. We must not, therefore, conclude as a Certainty, that no Kind of Fluid issues from the Wound, because we are unable to see any: for though, at first, nothing is indeed perceivable, it is common after a few Hours to observe a Slime or *Mucus* adhering to the wounded Parts, and which issues, without Doubt, from the Vessels that are cut asunder, though in too slow a Manner, and too transparent, to be taken notice of. It is moreover evident, that all the Juices of this Creature are extremely viscid: and, perhaps, to that viscous Quality may reasonably be imputed the Smallness of their Effusion, and the sudden closing of the Vessels, or healing of the wounded Parts: something of which may also probably be the Reason, why many other Animals, such as Snakes, Eels, &c. live many Hours after they are cut in pieces; though

though from the less Viscidity of their Juices, or the larger Dimensions of their Vessels, or both together, their Parts are unable to continue alive, and produce others, as those of the *Polype* do.---'Tis not my Intent, however, to impose Conjectures on any body, and therefore leaving them, we'll proceed to real Facts.

'Tis become a common Question, How long the Parts of a divided *Polype* will be reproducing what each wants to make it a perfect and compleat *Polype*? And the best Answer to this Question is, that the Time will be longer, or shorter, according to the different Circumstances of the separated Parts, and in Proportion to the Warmth or Coldness of the Weather, to the Care taken of them, and perhaps to other Particulars we are unacquainted with. But in order to explain this a little more clearly, it may be proper to give a brief Account of what usually happens to each of the divided Parts.

If, for Instance, a *Polype* be cut in two Pieces, across the Body, the Head-Part will frequently seize a small Worm as soon as it can be offer'd, and swallow as much thereof as its Piece of Body can be extended to contain; and yet, unless the Cut was made so near the Head that the Piece of Body thereto is extremely short, none of the Worm so swallowed will issue out at the wounded End:

which proves that End is closed, or, in other Words, that the Wound is healed. But if any of it does push out, when fed immediately after cutting, as now and then happens in the above Case, the whole Worm will quickly be protruded, and the Sides of the Wound unite. When all this is performed, which frequently requires less than an Hour's Time, it plays its Arms, and (excepting its being unable to fasten or hang by the Tail-End) appears as well as any other *Polype*; and in a few Days produces a new Tail.

But the Tail-Part, where an Head is wanting, requires a longer Time to make so good an Appearance: for though it soon fastens by the Tail, contracts, and extends, which are undoubted Tokens of its being alive, it is totally disabled from eating till it produces a new Head, furnished with Arms to seize and hold its Prey; which, in cold Weather, requires a Week or more; but, in Summer, is often effected in three or four Days. As soon as the Arms come out, it will eat greedily, and may be reckoned a perfect *Polype*; and, if well fed, will grow longer and larger than those that never were cut, but the Arms are generally shorter, and more blunted at the Extremities.

If a *Polype* is divided through the Middle, Length-ways, the two Halves will commonly erect themselves on their Tail-Ends,
play

play what Arms are not cut off in the Operation (as some of them most frequently are) seize their Prey, and eat in an Hour or two's Time. And as the Food bursts not out of their Sides, though their Bodies are much distended therewith, but on the contrary they appear round, smooth, and without any Scar, we may conclude them perfectly healed.----This Way of Division makes two *Polypes* of one in the shortest Time of any; for abating the awkward Disposition of what Arms they have, and the want of a few more, both Parts in two or three Hours appear as fair and well as others that have suffer'd nothing. The Defect of Arms is repaired also in a few Days.

A *Polype* cut, transversly, in three Parts, requires four or five Days in Summer, and longer in cold Weather, for the Middle Piece to produce a Head and Tail, and the Tail-Part to get a Body and Head, which they both do in pretty much the same Time. The Head-Part always appears a perfect *Polype* sooner than the rest, as was before observed.

In whatever Number of Pieces a *Polype* can be divided, each Piece (as I have found by repeated Trials) will re-produce all the Parts necessary to make it a compleat *Polype*, in a Time proportionable to the above Account, which may therefore serve as a Kind of Rule to judge by.

I have sometimes divided a *Polype*, and waited till the Parts were again perfected, then have cut them in the same Manner I did the first; and as soon as each Division was restored anew, have repeated the like Operation on those also: and thus have proceeded, repeating my Divisions and Subdivisions, as fast as the Parts wanting were re-produced, for four or five Successions: and I do not know that one of them ever failed *.

'Tis indeed surprizing, to see Creatures multiplied by such Means as one would expect should certainly destroy them: and what is still more extraordinary, *Polypes* produced in this Manner grow much larger, and are far more prolific, in the Way of their natural Increase, than those that were never cut. It is very common, when a *Polype* is divided transversely, to see a young One push out from one or other of the Parts, and sometimes from both of them, in a very few Hours after the Operation has been performed: and, particularly from the Tail-Part, two or three are frequently protruded, in different Places, and at different Times, long

* It has been observed by Mr. TREMBLEY, by some curious Gentlemen to whom I have given these Insects, and by myself, that their Bodies sometimes break or fall asunder of their own Accord, reproduce what each Part wants, and make two *Polypes* of one.

before that Part acquires a new Head, and consequently whilst it can take in no fresh Nourishment to supply them with: and yet the young Ones proceeding from it, under these Disadvantages, thrive as fast, and seem as vigorous as those produced by perfect and uncut *Polypes*.

Some Care and Method is requisite in all Experiments to make them succeed well: and whosoever would see the wonderful Restoration of these Creatures, must provide sharp Scissars, and have a small open Vessel, filled with good River or Pond-Water, in Readiness to put the Parts into the Moment they are cut asunder; and that, especially, when the Operation is performed on a Slip of Paper, where they will otherwise quickly become dry and occasion a Disappointment.

Nothing after this is necessary, but to shift their Water, clean their Vessel at due Intervals, and heedfully observe that none of the little Pieces are poured away with it. If this be done, there is Reason to believe they will very seldom miscarry, since amongst all the Numbers I have divided, not a single Piece has failed to produce a compleat *Polype*, the Tip of one Tail excepted. But all People are not equally careful, or fortunate, in making Experiments: and as, with some, whole *Polypes* have been dissolved, the Parts
of

of *Polypes* would certainly have come to nothing, in the Hands of the same People, had they been cut to Pieces.

What Kind or Degree of Pain this Creature feels upon being divided, it is impossible to conceive or know: but we commonly find that the Parts contract themselves immediately after the Operation; and a Sort of Tremor or quivering Motion may frequently be observed in them by the Microscope. Besides, as the Sense of Feeling is so exquisitely quick in the Arms, we cannot well suppose the Body to be without its Share. And yet, its eating so soon upon it, would almost induce one to imagine, either that the Pain is not very great, or that it is over instantly, or at least that the Uneasiness of Hunger is more grievous to this Insect than that of being cut asunder: in the same Manner as Dogs, Cats, and some other voracious Animals, if hungry, will eat with Greediness, though they are so hurt or wounded, that we have good Reason to believe they must suffer acute Pain.

The Quivering or trembling Motion above mentioned, is more particularly to be discerned, when only a little Bit of the Tail-End is cut off: which seems to imply some extraordinary Sensibility in that Part; and reminds me of what I have often been assured, by People who said they had frequently

frequently experienced it, that a small Blow upon the Tail of an Eel, Viper, or other Serpent will kill it instantly; though it would live several Hours after being cut in Pieces.

Since this extraordinary Power of repairing itself, when cut in Pieces, has been discovered in the *Polype*, it was supposed, with good Reason, (as Nature in her Operations proceeds not by Fits and Starts from one Order of Being to the next, but by gentle and almost imperceptible Gradations) that other Creatures might be endued with a like Capacity: and, upon making the Experiment, several have indeed been found able to do the same.

A Water-Worm about an Inch and half long was discovered by Mons. BONNET, which repaired itself after being divided; and Mons. LYONET found another above three Inches in Length, which being cut into thirty or forty Pieces, every Piece became a perfect Worm.

Mons. GUETTARD and Mons. JUSSIEU, made Trials of a like Kind, at the Request of Mons. REAUMUR, as well on the *Urticæ Marinæ* as on *Star-Fishes* found on the Coasts of *Poictou* and *Normandy*: and after the *Star-Fishes* had been broke and cut into several Pieces, they not only continued to live, but their Wounds were perceived to
cicatrise

cicatrize and heal: The ingenious Mr. TURBERVILLE NEEDHAM, of *Troyford*, near *Southampton*, has performed the same Experiment with like Success, as he has informed the *Royal Society*; and Mons. GERRARD DE VILLARS has seen the *Urticæ* on the Coast about *Rockelle* reproducing all the Parts cut away, and the *Star-Fishes* putting forth new *Radii* in the Place of those they had lost.

Mons. REAUMUR and Mons. BONNET have found some Sorts of Earth-Worms repair themselves likewise, but with much more Slowness and Uncertainty: and you, SIR, was lately pleased to shew the *Royal Society* four small Water-Worms, not only alive and vigorous, but in all Appearance perfect, which about three Weeks before had been the Pieces of two Worms cut in Halves, and sent to you out of the Country. At the same time you likewise shewed a Worm of the same Kind, that had been never cut, and also two other Worms, that seemed to differ from it only in being something shorter, which had been the Parts of a Worm cut in two Pieces by yourself about ten Days before, and which had repaired themselves in your own Custody.

It may now, perhaps, be expected, that I should bestow some Pains to determine, whether this Reproduction, is, or is not to

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be

be called a Kind of Vegetation: but, SIR, it would, in my Opinion, be highly impertinent to waste your Time in Arguments about that Matter, unless we knew a little better the exact Boundaries of animal and vegetable Life, and could certainly point out where one ends, and the other begins. Instead, therefore, of wrangling about Words, or entering on a Dispute I am wholly unqualified to decide; and which, if I could clear it, is, I think, of no great Consequence; I shall conclude this Chapter, and prepare the Way to my Experiments, by endeavouring from the whole of what has gone before to draw up a concise and plain Description of the *Polype*.

The POLYPE is a little fresh-water Animal, whose Body extends or contracts itself, occasionally, from the Length of an Inch or more, and the Thickness of an Hog's Bristle or less, to the Shortness of a single Line, with a proportionable Increase of Width. Its Form is round and tubular: having at one End the Head and Mouth, about which six, eight, ten, and sometimes more Arms, of a most curious Construction, are regularly placed like *Radii*. These Arms can stretch out to considerable Distances, or contract, as the Body does; and serve, like a Net or Snare, to entangle little Insects that come within its Circuit. At the opposite End is
the

the Tail and *Anus*; and on this End it usually stands upright at the Bottom of the Vessel it is kept in, or adheres by it to the Side thereof.

Its most remarkable Parts are the Arms, Mouth, Body, Stomach, Tail and *Anus*; all which are distinctly represented in the Frontispiece to this Attempt.

It brings forth young Ones in great Abundance, and without any Copulation, by a Protrusion from its Body of minute Protuberances, which in two or three Days become perfect *Polypes*, and fall off from the Parent; after which they undergo no other Change. It may likewise be multiplied artificially, and in a wonderful Manner, by being cut in Pieces; every Piece repairing itself in a few Days, and producing whatever Parts are wanting to make it a compleat *Polype*.

It feeds on small living Animals, such as *Water-Worms*, *Pulices Aquatici*, or *Water-Fleas*, *Nymphæ* of *Gnats*, &c. and is more greedy and voracious than any other known Insect: instantly seizing and devouring whatever of such Kind is put within its Reach, and that almost at any Time it is offer'd: and when once it seizes any thing, it will sooner lose its Arms than let it go.

As it has no Eyes, 'twas necessary its Sense of Feeling should be extreemly quick; and

so we find it is, for on the least Touch of its Prey, it catches hold of it, be it ever so nimble, and opening its wide Mouth, swallows it down, gradually, till its Stomach and Body are distended like a blown Bladder.

Its Digestion also is as remarkably strong as its Appetite is ravenous, for in the Space of a few Hours, a Worm, &c. is reduced, by the Action of its Stomach, to a mere Pellicle, as thin as the finest Cobweb, and evacuated upwards by the Mouth.

In short, the Vigour and Strength of Life this Creature is endued with, are, I think, sufficiently shewn, by the former Particulars of this Discourse; and the Experiments that follow, will, I believe, fully prove how tenacious thereof it is.



C H A P. X.

A COURSE of EXPERIMENTS
on the POLYPE.

EXPERIMENT I.

Cutting off a POLYPE's Head.

MARCH, 25, 1743.-----About seven in the Evening, I cut a *Polype* in two Parts, transverſly, whoſe Body and Arms were, before Section, when extended to the utmoſt, near three Quarters of an Inch in Length.

In order to perform this Operation, I placed it in Water in a pretty deep concave Glaſs *Lens*, in which I likewise examined it in the Microſcope, both before and after it was divided.

I attempted to cut it pretty near the middle as it lay extended in the Water: but the Glaſs ſlipping, and the Creature happening to contract itſelf juſt at the ſame Inſtant, my Sciſſars wounded it as cloſe as poſſible to the Place where the Arms come out; and, not being very ſharp, I was forced to cut in the ſame Place two or three Times, before I could ſeparate the Head entirely from the Body.

This *Polype*, the Day preceeding, had swallowed a Worm above an Inch long, which it would not take at the Time I offered it; but having left the Worm in the Glas of Water with the *Polype*, though it had crawled to some Distance from it, when I came to look two Hours afterwards, I could not find the Worm: but from the swelling and sudden Increase of Bulk in the *Polype*, I had good Reason to suspect its having swallowed it. And I now discovered that the Fact was really so: for, upon this Division, good Part of the Worm came, undigested, out of the Body or Stomach of the *Polype*, and was by me pulled away with the Point of a Pin, after I had viewed it with the Microscope, and fully convinced myself what it was. I examined, likewise, the Head and Body thus sever'd, by the same Instrument, and observed, that the Arms in the Head-Part contracted themselves at first, and became as short as I believe they could, in which Position they formed an exact Star with ten *Radii* or Points: but upon putting it in fresh Water, after about a Minute, the Arms extended very much. The Body-Part shewed also undoubted Proofs of Life, by becoming sometimes longer and sometimes shorter, exactly in the same Manner as it had done before Cutting.

All

All this was performed with great Care and Attention ; the two Parts were immediately afterwards put separately into Glasses of Water, and kept in the same Manner during the whole Time mention'd in this Account; and so were all the other Pieces of *Polypes* spoken of through the Course of these Experiments. A Precaution I judg'd necessary to prevent any Possibility of Mistake.

March, 26.---I looked this Day several Times at each Part of the divided *Polype*. The Head (which had scarce a Hair's Breadth below the Circle where the Arms come out) resembled very much a Star or Flower, with ten Points or Leaves, as in the Figure, A.



These Arms by different Extensions and Contractions gave evident Signs of Life.

The Tail-Part lay stretched out thus, B. It shew'd Tokens of Life, by sometimes contracting, appearing plump, and being in Colour like a perfect *Polype*.



March, 27.---On this Day at 3 o'Clock in the Afternoon, the Head-Part had plainly
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produced a Body of about one twentieth of an Inch in Length, and appeared in this Manner. The Arms played in the Water freely, and the whole, standing upright, seemed like a small but compleat *Polype*.



The Tail-Part continued most commonly stretched out, as in the Figure given yesterday: but the End whence the Head was cut, appeared now quite rounded and smooth, and thicker than in any other Place. On one Side of the Body a minute Protuberance was observable, little bigger than the Point of a Pin, which I conjectured



to be a young One sprouting forth. Its whole Figure was thus.

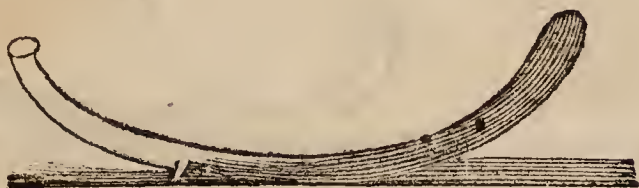
I this Day offered a Piece of Worm several Times to the Head-Part, but it would not eat *.

March, 28.----The Head-Part appeared to Day little different from yesterday as to Form, but seemed to place and rear itself on its But-End more readily: it likewise

* Its refusing Food was probably owing to the Coldness of the Weather, which makes this Creature less voracious; for the Head-End of those cut in hot Weather, seldom fails to eat, as soon as a Worm can be given to it. Some Cause of it may likewise be imputed to the exceeding Smallness of its new Body.

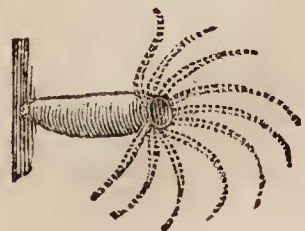
extended and contracted its Arms and short Body more frequently.

The Tail-Part extended to near three quarters of an Inch, appearing about the Thickness of an Hog's Bristle, and lying as in the following Figure.



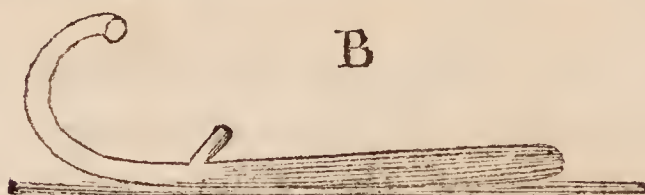
The End whence the Head was cut, lay constantly, till this Morning, groveling at the Bottom of the Glass, as in the former Draughts; but to Day it was commonly raised as much as in the last Sketch, and sometimes a good deal more. The small Protuberance I observed yesterday was now considerably grown, and evidently a young *Polype*: and from that Production to the Extremity of the Tail appeared much whiter and more transparent than the rest, or than it had done before, though ever since the Separation it had been the clearest Part.

March, 29.---The new Body produced by the Head-Part contracted and extended itself freely: when stretched out was more than the Tenth of an Inch in Length; fixed itself by the Tail to the Side of the Glass, play'd with its Arms, and seemed in all Respects a perfect, though small *Polype*: but would not eat.



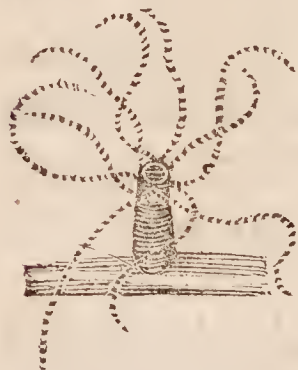
The

The Tail-Part was greatly extended most of this Day, as in the two annexed Figures, A B.



But sometimes it lay contracted thus.

March, 30.---The Head-Part, which now appeared a compleat *Polype*, and nothing different from those uncut, but in having Arms too long in Proportion for so short a Body, stood erect all this Day, extending and contracting both its Body and Arms in the Manner of other *Polypes*.



It would not yet eat, though I several Times put Pieces of Worms within its Reach.



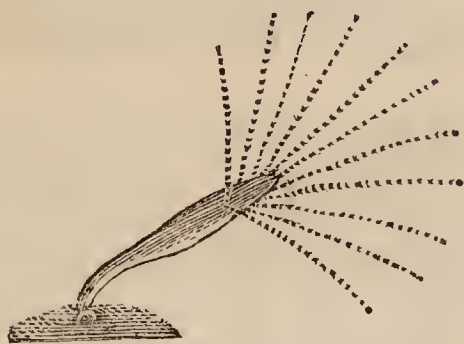
The Tail-Part lay to Day most frequently as in this Figure.

Its

Its young One appeared now considerably grown, and had four Arms: short Arms were also discernable on its anterior End, which therefore I shall now consider as a new-produced Head; but as I could not examine them by the Microscope, without taking it out of the Glass, and was afraid the Pressure or Motion it would receive thereby might prejudice the Experiment, I was unable to distinguish their Number.

In the Afternoon, I offer'd a Piece of Worm to this new Head, which made no Attempt to eat it: but the young One found Means to catch hold of it; and, what seem'd very extraordinary, as the young *Polype* sucked in the Worm, the Body of the Parent as well as its own Body swell'd, and became plump and bulky.

March, 31.--- The Head-Part and its new Body had now this Figure; and began to eat a Piece of Worm, but sparingly.



A Sort of Slime or Jelly envelop'd the new Head of the Tail-Part this Morning, and rendered its short Arms unable to seize or take hold of any thing. Its young One was grown much longer, and had six

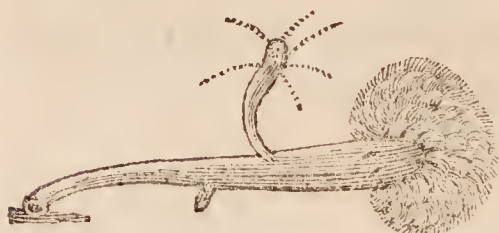


Arms;

Arms; and another little One began now to appear, sprouting out on the other Side.

April, 1. The new Body, produced by the Head-Part, appearing now strong and vigorous, and in no wise different from my other *Polypes*, I desisted from observing it any farther at present; and applied my Attention to the Tail-Part, whose new Head being extreamly embarrass'd with the Slime I mentioned yesterday, I endeavoured to disengage it, but with little Effect. It lay at the Bottom of the Glass all this Day, contracted, and unactive.

April, 2.---The slimy Matter continued to encircle the new Head, which appeared



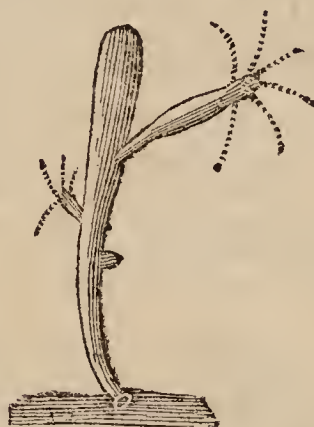
in a languishing State, from its Incapacity of eating any thing. The eldest young One extended its Arms and

Body, but would not eat.

April, 3.---The Slime seeming to increase rather than diminish: and therefore supposing it to be some incurable Distemper, threatening the Life of the *Polype*, I placed it in the Palm of my Hand in a Drop of Water, at half an Hour past ten this Morning, and with my Scissars cut its new Head entirely off. Then replacing it in a Glass of Water, the two young Ones and the Parent Body extended themselves greatly; and two
Hours

Hours afterwards, the eldest young One eat a Piece of Worm.

April, 24.---The Body-Part, from which I cut the new Head yesterday, raised itself on the Tail, and appeared more lively than for three Days before; another young One appeared likewise sprouting from it as the Figure represents; and four Arms were now evident on the second Production.



April, 5.---The young One that sprouted out yesterday was grown to day considerably; and six Arms appeared now on the other young one which had then but four: every thing else remained as before.

April, 6.---All the young Ones extended themselves much to day, and were very lively.

April, 7.---New Arms were discernable this Afternoon at five o'Clock, round the Part where a Head had been twice cut off: the young Ones were all three in a good Condition, and appeared together thus.

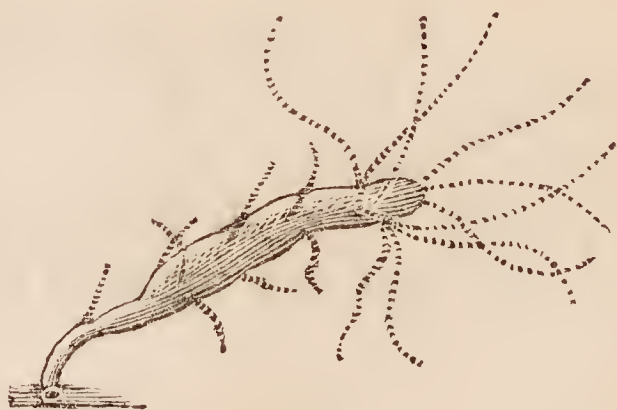


April,

April, 8.---The Arms on the new Head were this Morning much grown: in the Afternoon they extended greatly, and seized a Worm, which the *Polype* eat greedily; so that being now a perfect and compleat *Polype*, all farther Observations on this Part appeared unnecessary.

The Weather during the Course of this Experiment was very cold.

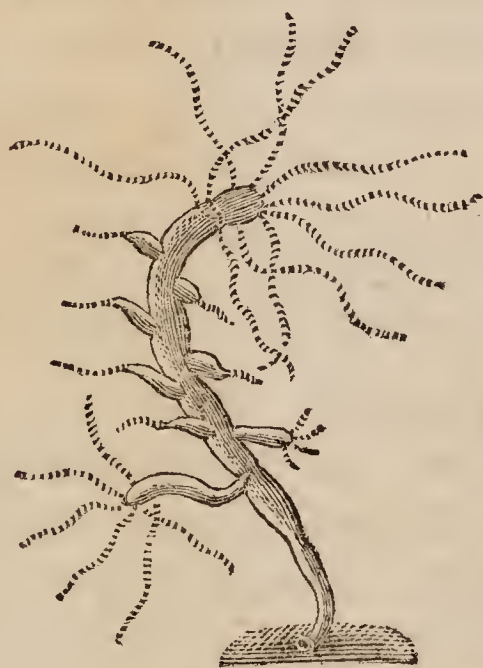
April, 23.---I intended to make no farther Mention of the *Polype* produced from the Head cut off on the twenty fifth of *March*, as it has been, since the first Instant, a large and fine *Polype*; but now observing several Arms growing from its Body, in an unusual Manner, I thought proper to give the Figure of it. Its Body was uncommonly irregular.



I have seen other *Polypes* with a single Arm growing from some Part of the Body: but never any like this, with several Arms thereon.

May,

May, 8.---The Arms that appeared on the Body of this *Polype* swell'd, gradually, from the Root upwards, into fleshy Protuberances, which, in a few Days, became young *Poly-pes*, and fell off in the usual Manner: seven of the Arms have done thus successively, and four other young Ones have been produced in the common Way: so that on this eighth Day of *May*, eleven have fallen off from their Parent: the Increase whereof, with five now hanging to the old One's Body, makes the number of thirty six perfect Animals, produced by a single Head, since the twenty fifth of *March* last.



The Appearance of this *Polype*, with some of its Arms changing into young Ones, is shewn in the adjoining Figure, as drawn from the Microscope.

EXPE-

EXPERIMENT II.

*Cutting a POLYPE in two Pieces,
transversly.*

*A*PRIL, 1, 1743.----I cut a *Dutch Polype*, which had two young Ones hanging to it, quite through its Body, a little nearer the Head than where either of the young Ones came out.

I placed it in the Palm of my Hand, in a Drop of Water, and waiting till it extended, slipped the Point of my Scissars under the Body, and divided it a little above the upper young One, where the cross Line describes it in the Figure.



I then put each Part into a separate Glass of Water, and observed That with the Head to it shewed a considerable Sense of Pain, by a Kind of trembling and convulsive Motion in the Piece of Body thereto belonging. The other Half contracted, and lay without any Sort of Motion, from fix in the Evening, when it was cut, till the Time I went to Bed.

April,

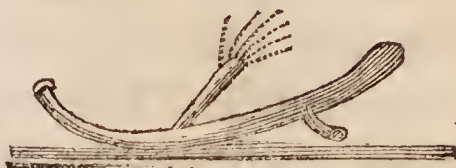
April, 2.---The two Parts of the *Polype* lay this Morning very quiet, but extended very much: the wounded Ends of both were considerably rounded and healed, and appeared in this Manner.



Examining them again in the Afternoon, the Arms on both appeared in Motion; and offering a Worm to the Head, it seized it greedily and eat it. The young One on the Tail-Part devoured likewise a Piece of Worm much longer than itself: after which, both were sensibly larger than before.

April, 3.---I found this Morning the *Exuviae* of the Worms, evacuated by the two Parts of the *Polype* and lying in the Water. The wounded End of the Head-Part seemed now quite well, and it appeared as perfect as any other *Polype*: though it did not raise itself upright on the Bottom of the Glass, or adhere to the Side thereof by the Tail, as they usually do; but continued lying in the same Posture as yesterday, only somewhat more contracted.

The Tail-Piece continued most of the Day extended thus. Neither Part would eat: occasioned, perhaps, by their being full fed yesterday.



April, 4.---The Tail-Part, with its two little Ones, lay to day in the manner shewn hereby, with Arms just appearing on the youngest of them.



The Head-Part erecting itself on the new Tail, and being now become a perfect *Polype*, requires no farther Notice.

April, 5.---The two little Ones on the Tail-Part extended much this Morning. In the Evening, the eldest of them seized a Piece of Worm larger than its Body could possibly contain. It sucked in a Part, and its Body appeared greatly distended, the rest of the Worm hanging out of its Mouth, as in the Picture.



April, 6.---Part of the Worm continued hanging out of the young One's Mouth, from its not having yet digested and ejected what was taken into its Stomach yesterday. At nine o'Clock this Morning, minute Arms were just discoverable on the anterior End, which,

which, therefore, I shall now term the new Head.

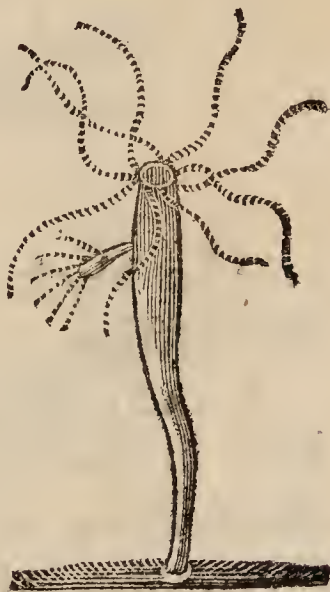


April, 7.--The *Exuvia* of the Worm were now discharged, and the Arms on the new Head appeared considerably lengthen'd. The young Ones, this Morning, lay in a contracted State. Observing them again at Night, I found the largest of them separated from its Parent, and extended greatly, in this Figure.



April, 8.----The Arms being now full-grown, and the new Head appearing compleat, I left off making any farther Observations.

It stood upright, in this Manner.



EXPERIMENT III.

A POLYPE cut in three Pieces transversely.

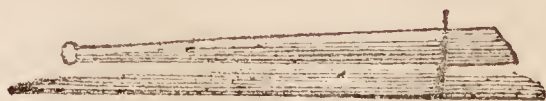
*A*PRIL, 13, 1743. I cut a *Polype* in three Pieces, by dividing it across the Body in two Places. The Animal being small, and contracting during the Operation, my Performance was not exactly to my Wish: for in cutting off the Head-Part four of the Arms were separated, and the Division was slanting, as in the Figure.



The black Line shews the Place of the first Section.

I then immediately subdivided the Tail-Part in two Pieces; whereof that next the Head-End, which I shall term the middle Piece, was extreamly small.

The Division was as the Figure shews.



April,

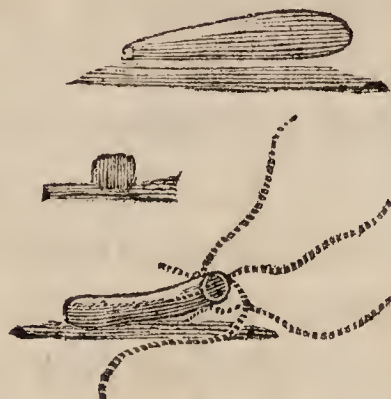
April, 14.--- The three Parts appeared alive and plump.

The Tail-Part, thus,

- - - -

The Middle - Part,
thus, - - - -

The Head - Part,
thus, - - - -



Each Part was very small; but the middle One, in particular, was not larger than a middle-siz'd Pin's Head.

April, 15.---All the Parts were much the same as yesterday, excepting that the Head seemed a little longer, and the Arms that had been cut were evidently a good deal lengthened.

April, 16.--- The Head-Part to day eat a Piece of Worm: its Arms appeared longer than yesterday, and its posterior End was tapered like a Tail.



The Middle and Tail-Pieces appeared plump and well, contracting and lengthening at different Times, but as yet no Sign of Arms.

April, 17.---The Head-Part this Morning raised itself on the But-End like a per-

fect *Polype*; which it now, in all Respects, appeared to be, excepting that its Body was shorter, and its repaired Horns not quite so long as the rest. It was most grievously tormented with minute Insects; an hundred at least crawling about its Body, Head and Arms*. They sometimes launched into the Water, swam about for a while, and then returned to the *Polype*. Their Shape is somewhat like a *Millepes*, or *Hog-Louse*. The Back rises in the Middle, is spotted, and seems to be a Sort of Shell. The Head projects an elevated Nose or Snout, which appears transparent. They creep along the *Polype* very nimbly, and when put from it into the Water, swim but awkwardly, with an unsteady and wabbling Motion.

The above Description will be better understood by the Figures underneath.



These Lice were taken notice of by Mr. LEEUWENHOEK at his first discover-

* See Page 76.

ing the *Polype*. He says, that one of them which had brought forth two young Ones, had her Body laden with *Animalcules*, whose Shape was flat below and roundish above, and which he observed in most Waters; and that they were above a thousand times less than the Creature they crawled upon, and hinder'd its moving. He saw likewise another *Animalcule* whose Body was almost round, teasing one of the *Polypes*, not only by running upon its Body, but by clinging so fast to one of its Arms, that notwithstanding all its Efforts to get rid of it, it could not shake it off: but he found at last that the Arm was lost in the Scuffle†.

None of these Animals infested the other two Pieces of the *Polype*.

The Tail-Part fixed its End to the Bottom of the Glass, and lengthened itself, but no Arms were yet discernable: See A.

The Middle - Piece lay along, much lengthened, and rounded at each Extremity: See B.



April, 18.---The Arms of the Head-Part, which had been injured, were this Morning grown as long as the other. It eat a large Piece of Worm, and was as fine a

† Vide *Phil. Transf.* Numb. 283.

Polype as any I have. The other two Parts had no Appearance of Arms, but looked in good Condition, and were more extended than yesterday.

April, 19.---The Middle and Tail-Parts seemed longer and better formed to day than they had yet done: but I could see no Arms.

April, 20.---This Morning little Arms began to shew themselves both on the Middle-Piece and Tail-Piece: they stood on their posterior Ends all this Day but would not eat. They appeared thus.



April, 21.---The Arms were this Morning considerably lengthened, and each Part eat a Piece of Worm with Greediness: so that now being compleat *Polypes*, I shall conclude my Observations on them.

EXPERIMENT IV.

*Cutting the Head of a POLYPE
in four Pieces.*

APRIL, 20, 1743. At fix o'Clock in the Afternoon, I cut off with my Scissars one single Arm of a *Polype*, with a little Bit of Flesh thereto, scarce larger than a Grain of Sand: when magnified, it appeared as the Figure, A.

I cut off a second Piece with two Arms, in the Figure, B.

And likewise a third Piece, on which were three Arms, in the Manner, C.



The fourth Part of the Head, which remained to the Body, had three Arms left on it, and two were cut from it in the Operation, close to their Roots. It was a large *Polype* with a young One hanging to it. Immediately after the Cutting it contracted itself in an Heap, but in about half an Hour appeared as in the Figure below.



My

My Sciffars had snipped a Slice away from one of its Sides, but that Piece was lost: the Wound healed, and could not be found after a few Minutes.

April, 21.---The three minute Parts of the Head cut off yesterday appeared plump, and shewed themselves alive by the Motion of their Arms. The Piece of Head remaining to the Body seized half a Worm greedily. The Part with three Arms fastened also on a Piece of Worm, though it seemed to have no Place to suck it into.

April, 22.---This Morning all the three Parts that had been sever'd from the Head were apparently in a good Condition, and their Arms played briskly in the Water. The fleshy Root of each was become of a round Figure, and looked as in the Draughts.



The Roots of the Arms which had been cut on that Part of the Head remaining to the Body, were grown in their Length: and the Head itself appeared, at three this Afternoon, round and well, as in the Figure.



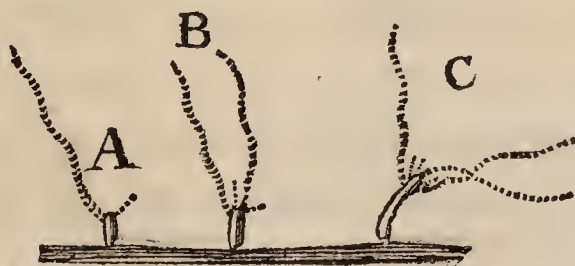
April,

April, 23.---All Appearances to day were little different from yesterday.

April, 24.---Young Arms might be now discerned, sprouting out on that Side the Head of the Parent *Polype* where the Arms and Flesh had been cut away: the Arms growing from the two old Roots were likewise much longer than yesterday: the young *Polype* drop'd off this Morning, and the Parent afterwards appeared thus;



The three Parts cut from the Head, now raised themselves upright, each having a minute Body, and an Appearance of young Arms, as in the under Figures.



The Piece with one Arm appeared as, A.
That with two Arms, as B.
And that with three, as C.

April, 25.---All the Parts appeared to day grown, and in good Condition, excepting that with one Arm, which lay now contracted, and seemingly in a languid State: the new Arms on the Head of the old *Polype* were grown more than half the Length of its other Arms.

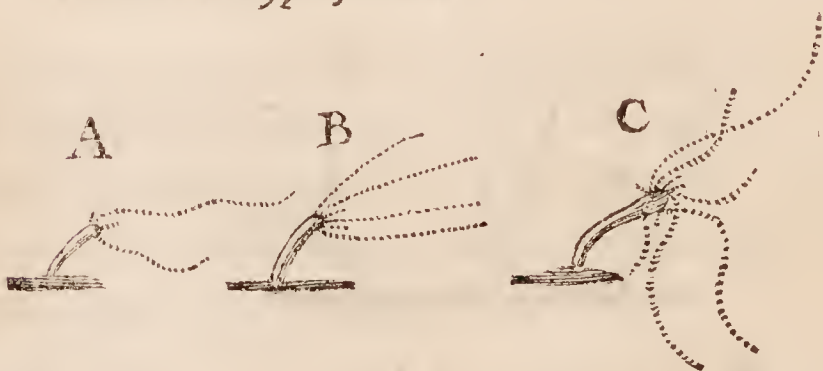
April, 26.---The Parent *Polype* was now perfectly restored, every Part of it seeming as compleat as before 'twas cut. The One-Arm-Piece recovered its Vigour, and had a perfect, but very minute Body, with two unequal Arms. The new Arms of the two other Pieces were longer than yesterday. They all eat greedily.

April, 27.---My three new *Polypes* had each to day, at ten in the Morning, an Appearance of more Arms beginning to come forth.

First *Polype*, as A.

Second *Polype*, as B.

Third *Polype*, as C.



I carried my particular Observations no farther; but they all became soon after as large and fine *Polypes* as any I then had.

E X P E-

EXPERIMENT V.

*Cutting a POLYPE in two Parts,
lengthways.*

AP R I L, 24, 1743.-----In the Afternoon, at five o'Clock, I placed an *English Polype* in a Drop of Water on a Slip of Paper, and cut it the long Way from Head to Tail, in its contracted State: the Manner of its being divided will be understood by the Figure, where the black Line denotes the Place of Section.



I immediately put the two Halves in a glass Vessel of Water, where they contracted for about half an Hour, and then appeared thus,



April, 25.--The two Halves were become this Morning, at eight, compleat *Polypes*, abating the Defect of the Arms. They rais'd themselves upright on their Tail-End; and, what is very extraordinary, each of them appeared nearly as large as when they both made but one: and that even before they eat,

eat, which they did as soon as Worms were offered. Their Form was thus.



April, 26.---New Arms might be perceived sprouting out from the Heads of both the *Polypes*, on the Sides where wanting. They disgorged the *Exuviae* of the Worms they eat yesterday, and extended themselves in the Manner underneath.



April, 27.---The young Arms were considerably lengthned. All this Day both *Polypes* hung to the Side of the Glass, extending their Arms and Body to a great Length. Each seized a Worm greedily.

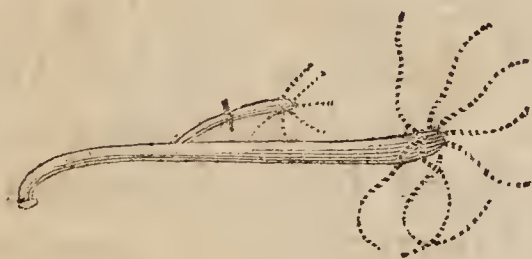
April, 28.---The Arms were now grown to their full Length, and each *Polype* seemed as perfect as those that were never cut.

EXPERIMENT VI.

*Cutting a young POLYPE in two Pieces
whilst still hanging to its Parent.*

APRIL 24.---Desiring to know the Consequence of cutting in two a young *Polype* before its Separation from the old One, I this Morning, at nine o'Clock, divided such a young One with my Scissars, as it lay in my Hand, extended in a Drop of Water, as near its Middle as I was able.

It was an *English Polype*, and at the Time of cutting appeared as in the Figure, where the black Line shews the Place of Division.



April, 25.---The Piece of the young One cut off, lay to day at the Bottom of the Water, extending its Arms, and lengthening its Body. The Parent adhered by its Tail to the Side of the Glafs, stretching out its Arms likewise, as in quest of Prey; but neither of them would eat, perhaps from having been full-fed about an Hour before
the

the Experiment was made yesterday. The wounded Parts of both seemed well.

April, 26.---The cut-off-piece raised itself on the Tail. The old *Polype* hung to the Side of the Glas as yesterday, and took a Worm with Eagerness. A Sort of Slime or *Mucus* issued from the Part where the young One had been cut off, and spread itself in the Water like a Film or Cobweb. Its Appearance was thus.



April, 27.---The Piece cut off, which I shall now call the little *Polype*, fastened by its Tail to the Side of the Glas, played its Arms, and seized a Bit of Worm with Greediness. The Parent hung as yesterday: Slime still issued from the wounded Place; and directly over-against it appeared another young One just beginning to push forth.



The little *Polype* being perfect needs no farther Notice.

April,

April, 28.---The young Production of yesterday appeared to day much larger. The old One continued hanging to the Glass Side, extended to a great Degree. The slimy Matter still issued plentifully from the Place where the Cut was given.



April, 29.---Very little Alteration to day: all Appearances nearly the same.

April, 30.---No Arms were yet discernable on the Part where the young One had been cut off. I now found Means to get the Slime from it pretty well. The younger little One was grown as large as the Part of the elder cut one.

May, 1.---This Morning, at eight o'Clock, I perceived little Arms sprouting out round the Place whence I cut off the *Polype* a Week ago, and also small Arms on the other little One. Their Appearance was thus.



K

May,

May, 2.---The Arms of both young Ones were to day lengthened considerably, and each greedily seized a Piece of Worm: so that being now perfect *Polypes*, any farther Account of them would appear superfluous.

They both dropped from the old One two Days afterwards.

EXPERIMENT VII.

Cutting a POLYPE lengthwise through the Body, without dividing the Head.

APRIL, 24, 1743.--Mr. TREMBLEY having divided the *Polype*, from the Head, through the Body, to the Tail, but without cutting through the Tail, and thereby produced several Bodies conjoined by one Tail; I was desirous of trying to divide One after a quite contrary Manner; *viz.* by cutting it lengthwise from the Tail to the Head, but leaving the Head uncut: in order to discover how two or more Bodies can be supplied with Food by one Head.

I therefore placed the largest *Polype* I had on a Piece of Paper, and whilst it lay contracted, cut it quite through the Tail and Body, stopping my Scissars as near the Head as I could. This was done at half an Hour past seven in the Evening.

The

The Section was as the Figure shews.



In doing this some of the Arms were injured.

April, 25.---I found the Body I divided yesterday conjoined again this Morning, at a quarter past seven o'Clock, without the least Appearance of any Wound or Scar, but considerably smaller than before 'twas cut: though, giving it a Worm, which it greedily laid hold on and devoured, it swelled out as large as before: and excepting three Arms, that were snipped off in the Operation, it seem'd in nothing different from *Polypes* that were never cut.

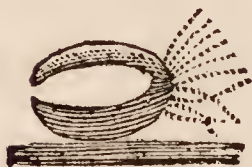
April, 26.---Three new Arms began to shew themselves where the former had been cut away: they continued growing in Length, gradually, till the first Day of *May*, when they appeared as perfect as any of the other Arms.

This was a remarkable Instance how soon the Wounds of these Creatures heal; of which I was pleased to find such a plain Proof, tho' I became thereby disappointed as to the Design of my Experiment.

EXPERIMENT VIII.

*A Repetition of the foregoing Experiment,
with different Success.*

MAY, 1.---The *Polype* made use of in the last Experiment having just eat a Piece of Worm, and appearing very large and fine, I put it on a Slip of Paper in a Drop of Water, and repeated my former Operation of cutting it the long-way from the Tail up to the Head, without dividing the Head. I performed the Operation at four o'Clock this Afternoon, as well as could be wished, and upon putting it in a Glass of Water, in a few Minutes it had this Figure.



In about a quarter of an Hour, two little Pieces of Worm came out of the Wound alive, and wriggled about in the Water.

May, 2.---The *Polype* abovementioned placed itself all this Day with its Head down, and its hinder Parts upright, at the Bottom of the Glass, in a contracted State. The two Ends of the Tail were in contact, but a large Opening appeared between them.



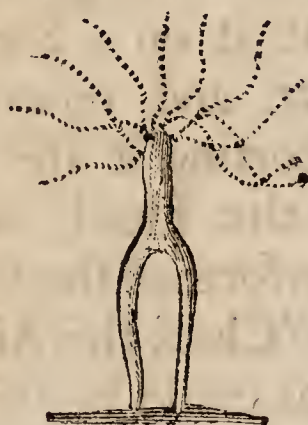
This was its Figure.

May

May, 3.---I found the *Polype*, at seven this Morning, erect, on its Tail-End, in this Manner.



May, 4.---The Ends of the divided Tail appeared to day afunder: it stood upright at the Bottom of the Glas, and extended itself as in the Figure,



Hitherto it had refused to eat, but now seized and devoured a Worm, which made both the Divisions swell and enlarge.

I continued my Observations on it for some Weeks. It did not often care for eating, or thrive so well as my other *Polypes*, nor had it much Increase: it frequently stood upright and contracted, something in the Shape of a Pair of Breeches, as the Figure shews.



A *Polype* I cut since in the same Manner at Tooting, for Mr. MILES, produced twenty-six in a Fortnight's Time, as he sent me

Word; that is to say, after it began to produce, which was the third Day from its being cut, when two came off: and that Day Fortnight the Number amounted to twenty-six, which he then put among his other *Polypes*. This was in very hot Weather.

EXPERIMENT IX.

Cutting a POLYPE in two Places, thro' the Head and Body, without dividing the Tail.

MAY, 1 1743. I cut an *English Polype*, longitudinally, through the Head and Body in two Places, but stopped my Scissars before they reached the Tail. I perform'd the Operation on a Slip of Paper, in the Manner the Figure shews.



May, 2.---The divided Head seemed to day a confused Heap of Slime and Arms, without any distinct Form: which Confusion was principally occasioned by Part of a digested Worm, which, on cutting, came out of the Stomach, and adhered to the wounded Head. Its Appearance was thus,

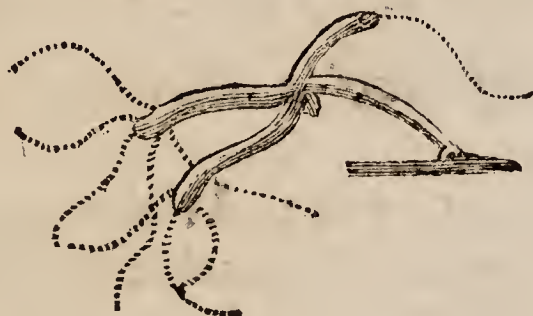


May,

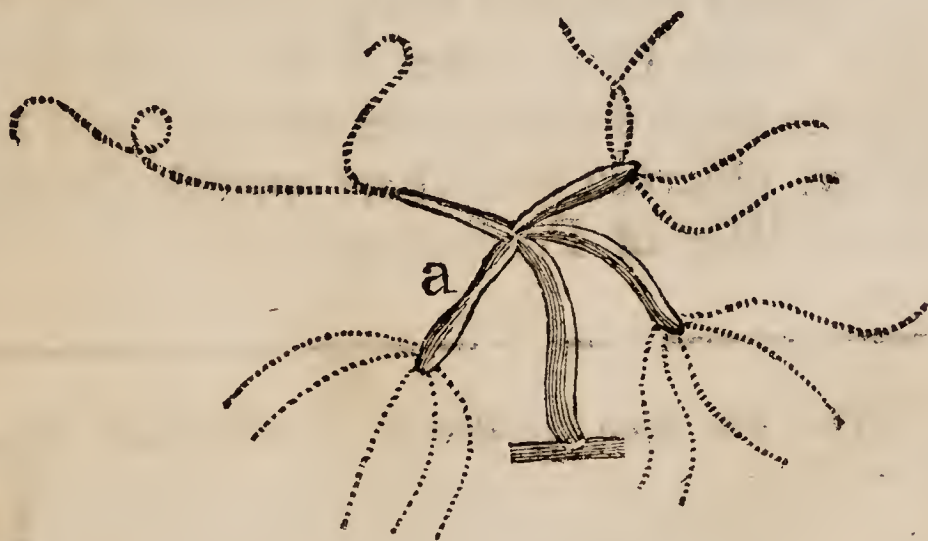
May, 3.---It still made an indistinct Figure; but I found Means to clear away the Slime from it, after which it lay along in this Manner.



May, 4.---The three Parts of the Head were to day very distinguishable, and each eat a small Piece of Worm. A young One began to push out at the Side of the Tail where the Cut ended. Its Appearance was thus,



Its Form remained nearly the same, excepting the growing of each Part, till the sixth Instant, when the young One(a) being perfect, I again examined it by the Microscope, and found it to have the following Figure.



It will be observed, that the single Arm on one of the Divisions is exceeding long, and has another shorter Arm issuing from the Side thereof; a *Lusus Naturæ* I have more than once seen.

The young One, (a,) fell off on the eighth Instant.

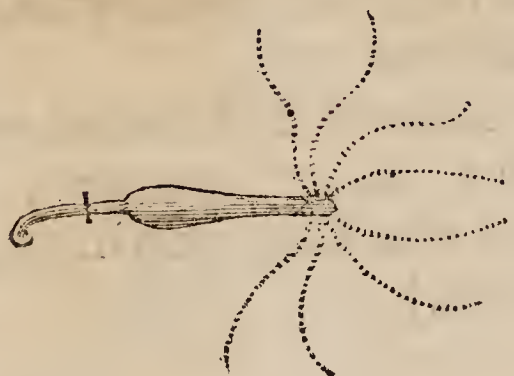
EXPERIMENT X.

Cutting off half a POLYPE'S Tail.*

MAY, 11, 1743. As the *English Poly-*
pes have a considerable Length of Tail, (especially when extended,) thro' the Middle whereof the Microscope discovers a long strait Gut passing from the Stomach to the *Anus*, in the same Manner as it does in a *Lobster*: I cut off this Tail at about half-way between the Stomach and its Extremity, to try if such a minute Piece of meer Tail would become a *Polype*, as Pieces of the more noble Parts have done. And this I was the more desirous to experience, as I had seldom observed this Part prolific in their natural Way of Production.

* This was again repeated in the Thirteenth Experiment.

The Figure shews the *Polype* as it lay stretched out, and the Place where the Piece of Tail was cut off.



The Body-Part, immediately after the Operation, being placed in a Glas of Water, contracted and extended briskly and often, and was seemingly in great Pain. The separated Piece drew itself together, then lay entirely motionless, and appeared of a white Colour, as at (a).

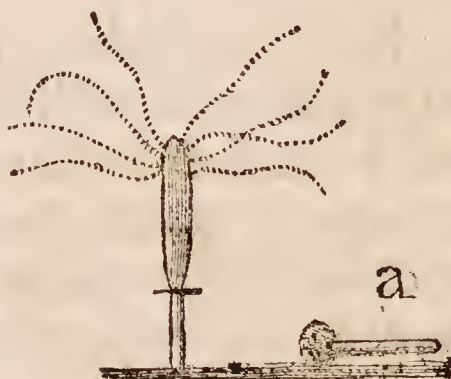
In about half an Hour, the Body-Part stretched out itself and Arms as it lay along, and seized a Worm as if nothing had happened to it: which Worm being lively and strong, and the *Polype* unable to fasten by the Tail, the *Polype* was dragged by it from one Side of the Glas to the other. Soon after the little Tail-Piece fixed itself upright at the Bottom of the Glas, and extended itself as at (b).



May, 12.---This Morning I perceived two young Ones pushing out, exactly opposite to each

each other, from the Body-Part of the *Polype*, just above the Beginning of the Tail, neither of which could be discerned yesterday. It stood erect on its Extremity, which seemed healed and well.

The little Piece of Tail looked white, but well. It lay along extended, and the wounded End was somewhat slimy, as in the under Figure (a.)



May, 13.---The two young Ones were to day considerably grown. It continued in an upright Posture, and the wounded End appeared more knobbed and like its former Tail.

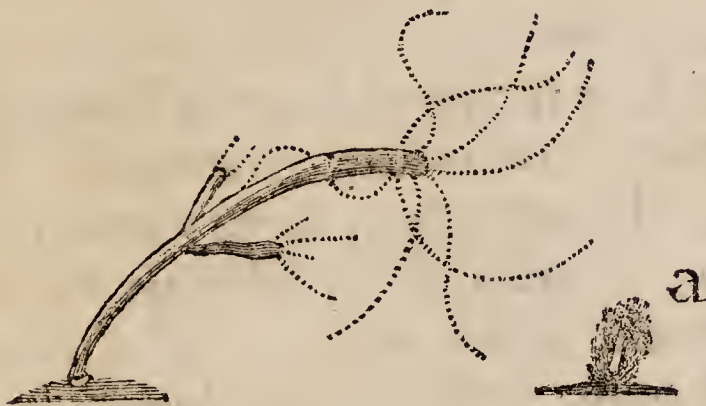


The little cut-off Extremity appeared very slimy, and lay along in the same Manner as yesterday.

May, 14.---Both the young Ones were grown : all Things else as before.

May, 15.---I found this Morning one of the young Ones had two pretty long Arms,
 2 and

and two more that were shorter; the other had likewise two Arms, directly opposite to each other. They all extended as the Figure shews.



The Tail-End appeared standing upright, but was very slimy, and so white and transparent as hardly to be discerned. See the above Figure, (a).

May, 16.---One of the young Ones dropped off this Morning and had six Arms, the other had now four.----The Slime was so increased about the Tail-Piece, that finding it impossible to disengage it, and perceiving the whole Substance of it converting into a like Matter, I threw it quite away.

This Slime appears to be the worst and most dangerous Distemper attending *Polypes*: for nothing seems to threaten them so much as Dissolution, of which such a *Mucus* or Slime is the Prognostic.

EXPERIMENT XI.

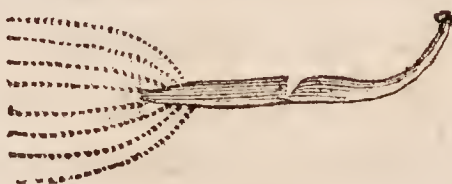
Cutting a POLYPE transversly; not quite through.

MAY, 11, 1743. I cut a large *Polype*, when contracted, tranversly, in the Middle, through about three Parts in four of its Body; in order to try whether the divided Parts would unite again, or if a Head, or Tail, or both, would be produced; or what would be the Consequence of such a Section.



The Cut was thus.

On putting it into Water, it lay at first in a Lump, and without Motion, at the Bottom of the Glass, but in about a Quarter of an Hour extended it self in this Manner.



Soon afterwards it reared itself on the Tail, and played its Arms about: whereupon I offered it a Piece of Worm, which it greedily caught hold of; and visiting it an Hour after, I found the Worm quite eaten up, the Body greatly distended, and the Lips of the Wound perfectly closed, but
a kind

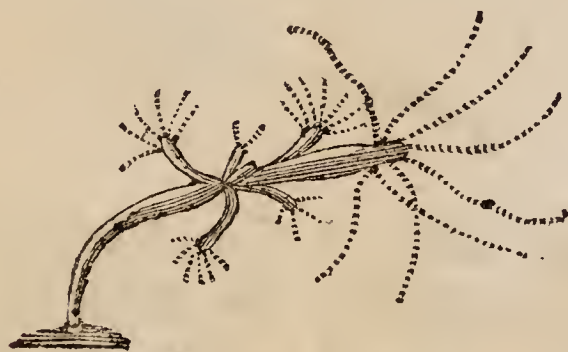
a kind of Stricture in the Place where it had been cut, which made the *Polype* appear smaller there than immediately above or below it.



May, 12.--It hung to day from the Glass's Side by the Tail, and appeared thus.



May, 13.---A young One pushed out this Morning just where the Section had been made; the next Day another appeared close by the former; and in three Days more, no less than six were seen, at, or very near the Place where the Cut had been; the Figure whereof was thus.



This and the following Experiment would induce one to believe, that Cutting renders these Animals prolific.

E X P E-

EXPERIMENT XII.

Cutting a POLYPE obliquely, not quite through.

MAY, 11.---At the same Time, I cut another *Polype* through the Body, in its contracted State, obliquely, but did not entirely separate the two Parts; with the same View as in the last Experiment. It hung together by a very slender Piece of Skin, and appeared thus.



In about a Quarter of an Hour it was extended in the Water, and lay along in this Manner.



An Hour after, I found it standing upright, the divided Parts conjoined, with only a Sort of Scar where the Cut had been. It played with its Arms, as in the Figure; whereupon I gave it a Worm, which it greedily caught hold of.



Two Hours after this, the Worm was swallowed, and the *Polype* much distended. No Part of the Worm issued through the Wound, nor, indeed, did any Wound appear, but instead thereof a kind of double Body, as the Figure shews.



May, 12.---It stood upright on the Tail, all this Day, and appeared entirely perfect, but its Shape nearly the same as yesterday.

May, 13.---A young One appeared to day where the lower Part of the Wound had been, and others came out at different Times, till the sixteenth of this Month, when it lay extended with five young Ones hanging to it, in the Manner expressed by the Picture.



These *Polypes* all came off at different Times, and there was a numerous Succession of Others.

EXPERIMENT XIII.

Slitting a POLYPE open, and cutting off the End of its Tail.

MAY, 12, 1743.----I thrust the Point of my Scissars into the Mouth of an *English Polype*, as it lay in my Hand, contracted about half-way; and slit it down the Body, as far as to the Place where the Tail begins. Immediately afterwards, I divided the Tail of the said *Polype* in two, transversely, at about the Middle of its Length; which last Section was made, to try, once more, if such a Piece of meer Tail could possibly become a *Polype*; the *Tenth Experiment*, where it did not succeed, being in my Opinion not sufficiently conclusive, since the slimy Matter, whereby that Piece was lost, might possibly be an Accident that may not always happen.



This *Polype* had two large young Ones hanging to it, and at the Time of Cutting appeared thus.

This Figure shews the Slit along the Body; and the Cut across the Tail is express'd by the little transverse Line. Some of the Horns were shortened by the Operation.

On

On putting the Parts in Water, the slit Body lay in an Heap and motionless at first, but after some Minutes, the two young Ones extended, played their Arms about, and eat a Worm between them very greedily, each seizing on one End of it.

In a Quarter of an Hour the separated Piece of Tail fixed itself on its Extremity, and stood upright, appearing plump, white, and extended.

The Body of the *Polype* was slit open at six o'Clock in the Afternoon: at nine it appeared perfectly healed, and no otherwise different from what it was before cutting, than by having a shorter Tail. It seized and eat half a Worm.

One of the two young Ones having fallen off since the Experiment, raised itself on the Tail, and eat the other Part of the Worm.

May, 13.---At eight this Morning, the Body I slit open yesterday, seemed as free from any Wound or Scar as if nothing had been done to it, and it greedily eat a Worm. The Place where the Tail was divided appeared likewise quite well.

I observed a new young One pushing out since the Operation, and found I had cut off

L three

three Arms at that Time, five only being left. It had now the Figure A.

The Piece of Tail which had been cut off, fixed on its Extremity, stood upright, extended much, and appeared quite white and clear, as is shewn by B.

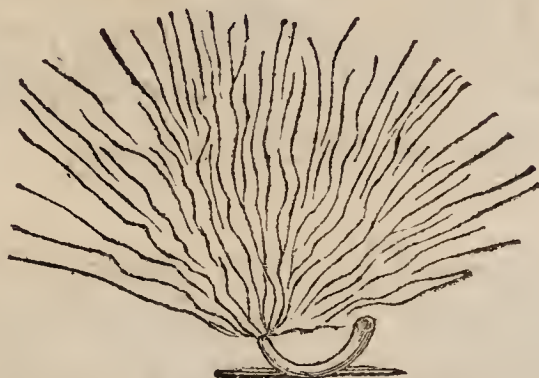


The young One that came off yesterday, being now in no wise different from other *Polypes*, needs no farther Notice.

May, 14.---The Body-Part had the same Appearance as yesterday, with this only Difference, that the injured Arms were grown somewhat longer, and the new young One a little larger.

This Morning the little Tail-Piece was clear, white, and generally extended: tho' sometimes it contracted; but soon extended itself again. In the Afternoon it lay along at the Bottom of the Glass, in a semicircular Form; a Slime issued from the cut Place, and spread itself all over the Water, making it seem

seem as if full of fine Threads or Cobwebs.
Its Appearance was thus:



May, 15.--- The Arms that had been injured were this Morning grown almost to their former Length. The Head and Body-Part whereto they appertain, had not yet raised itself, or adhered by its posterior End, since its Piece of Tail was cut off; but it eat heartily, and that End appeared pointed in an unusual Manner.

The forwardest young One fell off in the Night; the other shewed two small Arms; and a new Production was just visible as in the Figure.



The Tail-Piece lay in the same Manner as it did yesterday, but its Colour was rather whiter. The Slime continuing, I washed

it in several Waters, and by rubbing it gently with a Hair-Pencil, and the Help of a Pair of Nippers, used with much Care and Caution, I disengaged it pretty well therefrom; after which it lay contracted, and was very near as thick as long.

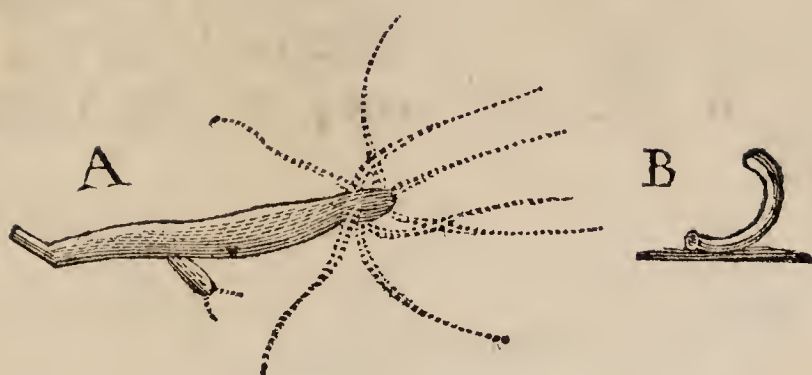
May, 16.---The two young Ones on the Body-Part were advanced in their Growth, as in the Figure A. The Tail-Piece appeared white and stood upright and contracted, as at B.



May, 17.---The largest young One pictured yesterday on the Head-Part was fallen off this Morning; and the other so far grown, as to shew the Appearance of two Arms. A new Production was likewise pushed out at the very Extremity of the posterior End, and seemed (as all the Parts lay extended) to be merely a Continuation thereof. See Fig. A.

The Tail-Piece lay along as at B, looking white and clear, but I think somewhat more opake at the anterior End than it has appeared since it was cut off.

May,



May, 18.---At nine this Morning the Head-Part lay extended and looked very oddly, the Production at its Tail-End which I observed yesterday having now four Arms, two longer and two shorter. The other young One had also six Arms. See Fig. A.

The Tail-Piece lay contracted, but seemed plump and well. See B.



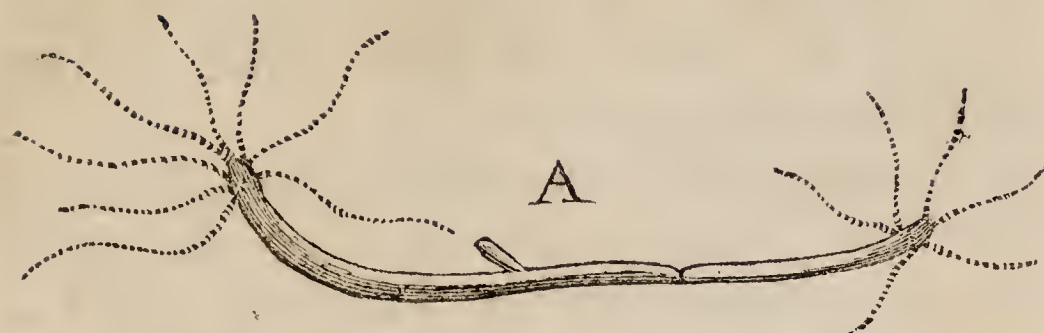
May, 19.---The Head and Body-Part continued extended almost in the same Manner as yesterday; but the new Production at its Tail-End was grown something larger, and had now six Arms. The young One at its Side seemed just falling off; and a new Protuberance shewed itself, issuing out almost directly against the other, as in the Figure A.

The Tail-Piece lay extended, and a couple of Arms began to be discernable at the End where it had been cut; as the Letter B shews.



A little Slime seemed troublesome about the *Anus*.

May, 20.---The Head and Body-Part was this Morning extended in an odd Manner, the elder young One separated, and the Production of yesterday much grown. The young One at the Tail-End was now almost as large as the Head at the other End; and, playing its Arms briskly, exhibited the Appearance of a *Polype* with a Head at each End; but, by close Examination, a Line might be discerned, which plainly shewed them to be two *Polypes*, that might be expected soon to separate. (See Fig. A.) They did not however come asunder in above a Fortnight, but grew so large, that, when fully extended, they were three Inches in Length.



The Tail-Piece had now four Arms, and appeared in very good Condition, allowing for the Inconveniency of some Slime at its posterior End, from which, with a little Trouble, I happily relieved it. See Fig. B.



In a few Days after this it grew very long and large, produced a great many young Ones, and became an exceeding fine *Polype*.

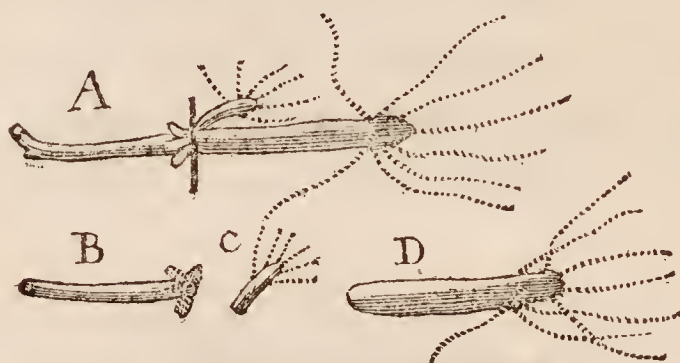
EXPERIMENT XIV.

Cutting a POLYPE with four young Ones hanging to it.

MAY, 25, 1743. I cut an *English Polype* in two, transversely, at three in the Afternoon, exactly where the Tail joyns to the Bowels and Stomach; at which Place

four young Ones were sprouted forth round the said Part, one being well-grown and having six Arms, the others small and of different Age and Size.

By this Section the eldest young One was separated from its Parent, and the three younger Ones left to the Tail-End. Its Figure before cutting was as A. The Parts when divided as B, C, D.



The Head-Part in a Quarter of an Hour seized and eat half a pretty large Worm, after which it lay thus.



The Tail-Part extended itself greatly. The little One that was cut off seized a Worm about two Hours after.

May, 26.---This Morning, at 8 o'Clock, the Head-Part seemed perfectly well, but did not yet raise itself on the wounded End.

The Tail-Piece lay extreamly extended, as in the Figure A.

The young One cut off yesterday appeared as at B.

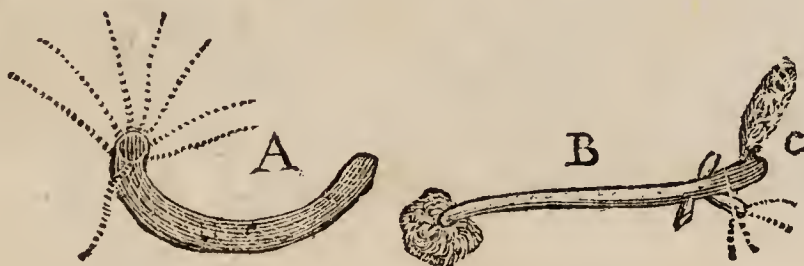
The other Part of it remaining on the Tail-End, is shewn by C.

The



May, 27.---The Head-Part had not yet produced a Tail whereon to raise itself, but lay at the Bottom of the Glass, as at A.

The Tail-Piece, B, lay extended, but not quite so much as yesterday; all its young Ones were grown, and the largest of them had now four Arms. A great deal of Slime issued from the Place C, where the young One had been cut off, and also from the *Anus*.



The young One's Tail being grown perfectly, it fastened itself to the Side of the Glass thereby.

May, 28.---A young One began to appear this Morning near the Tail-End of the Head Part, which did not yet raise itself on its Extremity, but lay as in Figure A, and eat half a Worm greedily.

The forwardest young One on the Tail-Part dropped off in the Night: the other two had now acquired, one four, and the other a couple of Arms; the Part where the
young

young One was cut off appeared with a round plump Head, but no Arms were yet discernable. See Fig. B.



The Slime was cleared away with a Hair-Pencil.

May, 29.---This Morning the Head-Part had pushed out another young One, and lay extended as the Letter A shews.

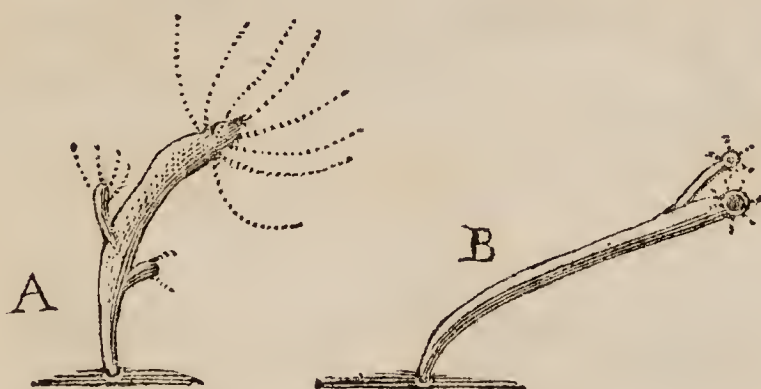
The Tail-Part seemed plump and well, one of its young Ones fallen off, the other grown and with six Arms, and the wounded Part very much lengthened. See B.



May, 30.---The two young Ones on the Head-Part appeared now with Arms; one had two, and the other four: and its posterior End was become a compleat Tail, whereon it stood erect, as A.

The young One that appeared with six Arms yesterday on the Tail-Part, dropped off this Morning: young Arms were just discernable on the anterior End of this Part,
and

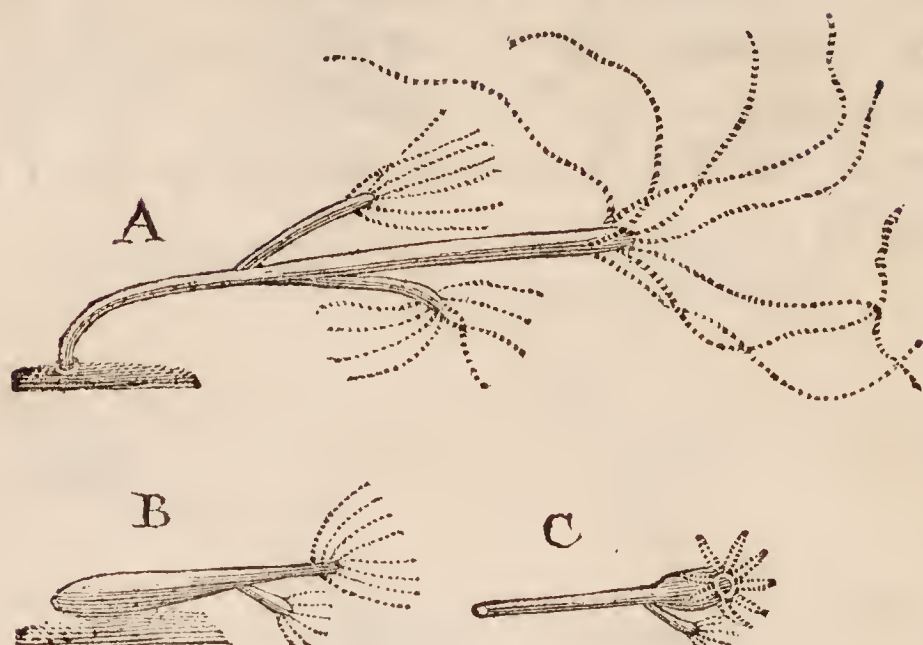
and also on the Part whence the young *Polype* had been cut at the Beginning of the Experiment. Its Tail was fixed to the Bottom of the Glass, and it stood like the Figure B.



May, 31.---The Body of the Head-Part appeared extended above an Inch and half in Length, with Arms exceeding long; its young Ones were likewise extended, as the Letter A shews, one having seven Arms and the other eight.

The new Head of the Tail-Part was now perfect, but the Arms not yet grown to their full Length. The cut young One thereto adhering was also compleatly restored.

This Part altered its Form several Times to day, appearing sometimes as at B, and at other Times like C.



June, 1.--- The Head-Part was grown surprizingly, and extended more than yesterday, and both its young Ones were fallen off this Morning.

The young One on the Tail-Part was likewise separated from its Parent, which, being a compleat *Polype*, I observed no longer particularly: but only took Notice, in general, that all the Parts here mentioned produced afterwards a numerous Offspring.

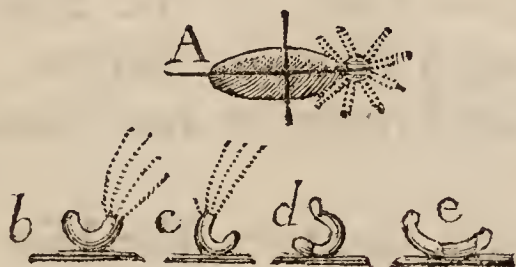


EXPERIMENT XV.

Quartering a POLYPE.

JUNE, 9, 1743. An *English Polype* being placed conveniently on a Slip of Paper, I cut it entirely through the Body and Head the long way, from Head to Tail: and then, turning the Paper, I gave it another Cut, transversely, across the Body; whereby it became divided into four Quarters, tho' not equal Ones. The Section is expressed by the Figure A.

Presently after the Operation the four Pieces appeared in the Water as (b c d e).



The Experiment was made about four o'Clock in the Afternoon; and, at ten the same Night, each of the Fore-Quarter Pieces eat a Bit of Worm, and lay along extended in the Manner of (a b).

The two hinder Parts were contracted, but appeared plump and rounded, as (c d).



June,

June, 10.--The two Fore-Quarters played their Arms this Morning, and their Wounds seemed perfectly healed and well. They lay at the Bottom of the Glas as the under Figures (a b) shew.

The other two Parts extended themselves, and lay in the Manner represented by (c d).

In the Evening they lengthened out more than they had yet done, and a little Protuberance or young One might be discerned pushing out from each, as (e f).



June, 11.---Each of the Fore-Quarters seized and eat a Piece of Worm, and more Arms appeared coming out from each as (a b).

The young Ones on the Hind-Quarters were much grown to day, and little Arms shewed themselves just beginning to peep out on one of them. One of the said Hind-Quarters raised itself also on the Tail-End, but the other lay along in a Manner explained by the two Figures (c and d).



June,

June 12.---One of the Fore-Quarters devoured so large a Piece of Worm last Night, that it appeared this Morning most exorbitantly swelled, as at (a,) the other lay extended, as (b).

Young Arms were just discernable on the anterior Ends of both the Hind-Quarters, which now erected themselves at the Bottom of the Glass, with their young Ones grown considerably, but one of them only furnished with Arms as yet. See (c d). They both caught hold of little Worms and eat them.



June 13.---One of the Fore-Quarters hung this Morning to the Side of the Glass, and the other stood upright at the Bottom; both extended themselves, played their Arms vigorously, seized Worms as soon as offered, and were become perfect and fine *Polypes*, in no wise different from such as were never cut.

The Arms that began to appear yesterday, round the new Heads of the two Hind-Quarters were lengthened very much, the young Ones hanging to them were also well grown, and were both furnished with Arms, as in the Figures A, B.

The



They were now compleat *Polypes*, and produced a numerous Offspring, as did also the two Fore-Quarters.

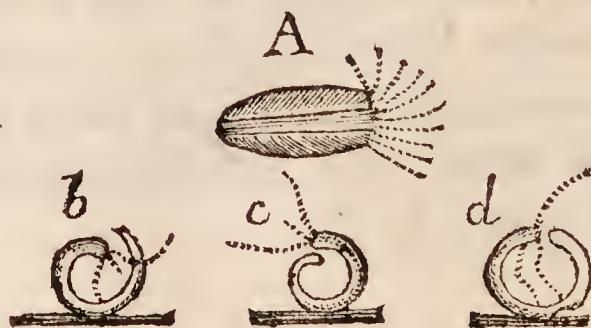
EXPERIMENT XVI.

Cutting a POLYPE in three Pieces the long Way.

JUNE 10, 1743. I divided a *Dutch Polype*, on a Slip of Paper, as it lay contracted, about four o'Clock in the Afternoon, in three Pieces, by cutting it in two Places quite through the Head and Body, lengthwise, as the Figure A represents.

Immediately after it was cut, the two Side-Pieces rolled themselves together, as at (b c).

The Middle-Piece made a perfect Circle, as at (d).



Some

Some of the Arms were injured in the Operation, but how many, or in what Manner, I could not, at present, be certain.

About ten at Night the two Side Pieces raised themselves on their Tail-Ends, as at (a b.) and each of them seized a Bit of Worm and eat it.

The Middle-Piece lay along extended, and seemed exceeding slender in the Middle: it would not eat, but its Sides appeared healed, round and well, like the other two. Its Form is shewn at (c.)



June, 11.---One of the Side-Pieces was fixed by its Tail to the Side of the Glass at ten this Morning; the other stood upright at the Bottom of the Water: the Middle-Piece continued pretty much the same as last Night. All three extended and played their Arms with a great deal of Life and Vigour, and the Middle-Piece devoured half a small Worm with Greediness, and was much distended thereby throughout its whole Length, Part of which however was still much thinner than the rest.

At seven in the Evening I gave a Bit of Worm to each of the Side-Pieces, who caught hold of it and eat it: they looked
M very

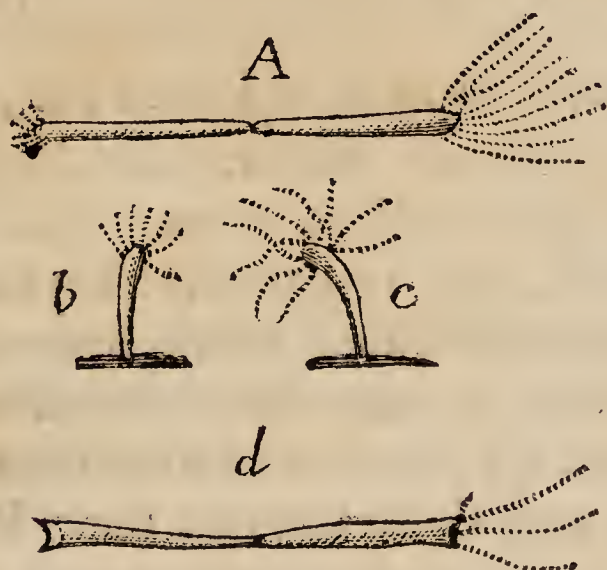
very well, and had young Arms beginning to appear between the old Ones. The Middle-Piece had also some new Arms, which made a pretty Appearance as it lay extended. It was much longer than the other two, and continued very slender and transparent in the Middle.

June, 12.--- This Morning an odd Appearance presented; the Middle-Piece shewed Arms at each Extremity: that is, nine well-grown Ones at the Head-End, and seven small Ones at the End that all along has seemed to be the Tail. It lay extended in a right Line, as the Figure (A) shews.

In changing the Water this Piece fell afunder, in the Place where it had all along been very thin and transparent: both Parts of it, in an Hour after, erected on their Tails, played their Arms, and were perfect *Polypes*, though One a little bigger than the other: they likewise seized on small Worms as soon as offered them with Greediness, and about two Hours afterwards appeared as (b.c.)

'Tis very remarkable, that here are four *Polypes* from One cut into three Pieces; and I think, I can be very certain neither of them is a young One pushed out in the natural Way. The Middle-Piece becoming Two is what creates the Difficulty; and the most rational Way of accounting for this is, by supposing that the upper and under
Parts

Parts thereof, having nothing to hold them together on the Sides when cut, might separate in the Water immediately after Cutting, and only hang together by the Tail-End, as at (d.)



The Length and Shape of this Piece from the Time of Cutting seem suitable to such an Accident: and if it really was so, the Sides of each Part must have grown together circularly, formed a Body, and become a compleat *Polype*; and the Reason it was not discovered sooner must be, because the Arms of one Part were cut off in the Operation.

The other two *Polypes* formed of the Side-Pieces appeared very well, and were greatly swelled with the Worms they eat yesterday.

'Tis unnecessary to transcribe my Diary any farther: but, in a word, they all four

grew large *Polypes*, and in a few Days produced so many young Ones, that I was forced to remove them into other Vessels.

EXPERIMENT XVII.

An Attempt to turn a POLYPE, and the Event.

JUNE, 12, 1743. Mr. TREMBLEY having assured us, in his Account of the *Polype*, that he has turned several of them Inside out: so that their Inside became their Outside, and their Outside their Inside; in which Condition they did not only continue alive, but eat, grew, and multiplied as if they had not been turned; I was extreamly desirous to attempt the same Experiment, though I knew not well which Way to set about it: but being sensible it must be effected some how or other by bringing the Tail and Body through the Mouth, and having the Honour of your Company at my Lodgings, about seven o'Clock in the Evening, I resolved, SIR, in your Presence to try what I could do.

For this Purpose, therefore, I employed a very slender Needle and the finest Thread I could get, at the End of which I made a small Knot: and placing a large full-fed *Polype*

Polype on a Slip of Paper with a very little Water, I thrust the Needle in at its Tail, and directed it through the Body and Mouth, in hopes that by the Assistance of the Knot I might be able to pull the Tail and Body through the Mouth.

But though I conducted the Needle and Thread with the utmost Care and Gentleness, I could not succeed in my Design; for the Roughness of the Thread, as it was drawn along, tore or rubbed away the soft and delicate Body of the *Polype*, the whole whereof adhered to it like Birdlime, leaving nothing visible but the Arms: which being desirous to save, I cut off the Thread with a Pair of Scissars, close to the Place where it passed between them, and then, putting them in Water, easily pulled away the other Part of the Thread.

When they were perfectly disengaged, I placed them before the Microscope in some Water, and found that the Needle and Thread had passed between them, exactly thro' the Center, where they had left a large Hole; that all the Body was entirely gone; and that nothing remained but merely a round Ring or Circle, with nine Arms (the Number I observed at the Beginning of the Experiment) issuing therefrom. The Figure it made was thus.



Though these Arms extended but little, they proved themselves alive by their continual Motions.

June, 13.--- The Circle appeared this Morning at eight, with all its Arms extended and playing briskly in the Water. The Hole in the Middle was somewhat lessened, but far from being closed. See the Figure.



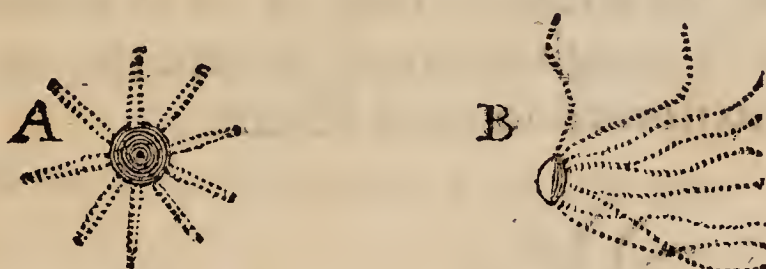
Upon offering a Worm, it was surprizing to see with what Strength and Greediness it clasped its Arms round it and held it fast. The Worm struggled very much, and tumbled it up and down with much Violence; but it quickly killed the Worm, and seemed to suck out its Blood, leaving it pale and colourless, though it had no Place to contain any thing, unless the Circle and Arms may be supposed capable of drawing Nourishment therefrom. And, indeed, if my Eyes, or my Imagination did not greatly deceive me, they were after this much plumper and darker than they had been before.

June, 14.---The Hole, where the Needle had gone between the Arms, appeared not open this Morning, but like the Head-Part of other *Polypes*: the Arms themselves extended and contracted several Times, but lay com-

commonly in the exact Figure of a Star-Fish with nine Radii: See A.

Observing it again towards Evening, I found it had turned itself on one Side, whereby it gave me an Opportunity of discerning a very short pellucid little Body grown from its Head-Part. The Arms were much stretched out and in continual Motion, which seemed owing in some measure to Multitudes of Lice tormenting it.

The Figure of it is shewn at B.



June, 15.---The *Polype* stood upright to day, stretching out and waving its Arms about in the Water, and seized a Worm with Greediness, which it soon killed and sucked the Blood out of: but none of the substantial Part seemed to be swallowed by it. The Body was a little longer than yesterday, but still very short and small.

By the Assistance of a fine Hair Pencil I brushed off Abundance of the Lice which swarmed every where about it; and after washing it three Times in clean Water, it appear'd relieved and easy.

June, 16.----The Body was evidently grown longer and larger, but in the Form of a Cone. It seemed in full Health and Vigour, and appeared extending its Arms, as below at A.

June, 17.---Its Figure this Morning differed not from that of yesterday, excepting that the Body was a little more extended. I gave it a small Worm, which it now made a Shift to swallow Part of: the Remainder was left hanging out of its Mouth, as at B, and continued so some Hours,



I observed it frequently for several Days after this, and took notice of very little Alteration, besides the Growth of its Body. It was fed every two Days, and sometimes oftner: and appeared so like other *Polypes* that I seldom examined it with Glasses; but placing it before the Microscope again, on the first of *July*, to my great Surprise I found it had then ten Arms, instead of nine which it had at first; and that three of the Arms issued out below the rest, and made as it were the Beginning of another Row.

Row. I immediately took its Figure as it is here given.

This Creature being again extremely lousy, I brushed it with my Hair-Pencil, and hoped by several Washings to have made it easy: but in the Operation, it slipped away, I knew not how, with the Water, and was unfortunately lost.



EXPERIMENT XVIII.

Turning a POLYPE Inside out.

JULY, 6, 1743. Having learned by one of Mr. TREMBLEY'S Letters, which you, SIR, received after the preceeding Experiment, and was pleased to favour me with a Sight of, that his Method for preparing a *Polype* for turning Inside out, is, by giving it a *Chrysalis* of the *Water-Tipula*; which, when swallowed, distends the *Polype*'s Stomach and Body, and having some Degree of Hardness, enables him, by gently pressing it from the Tail upward towards the Mouth, and at the same time pushing the Tail behind, to return it back again through the Mouth along with the Tail and Body, and thereby compleatly turn it. I was desirous of doing the same Thing; but being unable to procure any

any such *Chrysalis* at *London*, I fancy'd that perhaps I might perform this Operation by other Means, though somewhat in the same Manner.

I fixed my Eye, for this Purpose, on a very large *Polype* of the long-tailed Sort, with only six Arms, that had no young One issuing from it, and gave thereto one of the biggest Worms I could get; the whole whereof I was certain it could not possibly swallow. The *Polype* seized the Worm immediately, and in less than a Quarter of an Hour had gorged as much of it as its Body was able to contain, leaving one third Part at least hanging from its Mouth.

Things succeeding thus far to my Wish, I loosen'd the *Polype's* Tail from the Side of the Glass, took it out with a Scoop-Pen, and put it on a wetted Slip of Paper; for I judged it the best Way not to remove it before it had swallowed the Worm, lest it should refuse to eat afterwards.

This done, I set myself to work with a great deal of Care and Gentleness; and fixing my Paper whereon the *Polype* lay, by a Pin, to the Writing-Desk where I sat, I took hold of the Worm, by means of a Pair of Nippers which I held in my Right-Hand; and at the same Instant thrusting against the *Polype's* Tail with the Head of a very small Pin, (the Point whereof I had previously fastened into a Piece of Stick, which

which served me for an Handle to guide it by,) I proceeded cautiously and leisurely: and after several Tryals with the Worm and Pin, what by pulling one and pushing with the other, the Stomach, wherein Part of the Worm lay folded, came along with it through the Mouth, and was followed by the Tail, Pin and all: so that the *Polype* was really and compleatly turned, tho' the Pin had made an Hole quite through it, contrary to my Intent, and would have injured it much more, or, perhaps, unturned it, had I pulled it back the same Way it entered in: but being aware of that, I un-fixed the Pin from the Stick, took hold of it with my Nippers, (the *Polype* being spitted as it were upon it,) and pulled it away by the Head, leaving the *Polype* fairly inside out.

I put it then immediately into some Water, in a small clear shallow Glass-Vessel, made on Purpose for applying this Creature to the Microscope; and examining it with several Glasses of different magnifying Powers, distinguished, with the utmost Certainty, that what had been the internal Part of the Body was now really on the Outside, as far as the Stomach reaches, but that the Tail-End was still unturned, and remained within the Body.

The Arms now issued out from the End of the Head, instead of being ranged about the Sides thereof: and the Lips or Edges of the

the Mouth formed a Circle round the Arms, where turning very much outwards, they seemed endeavouring to fold themselves down the Sides of the Body, and bring it to rights again.

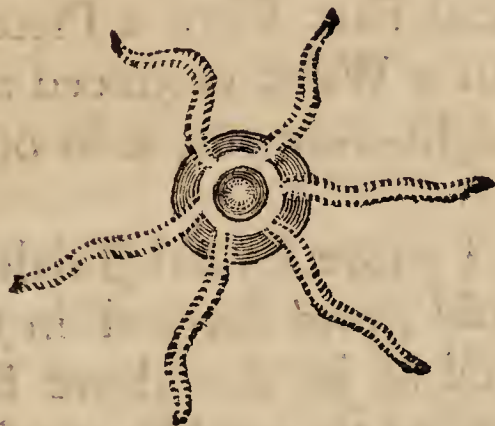
The present Outside appeared of a white Colour, flabby, uneven, and in many Places as if torn. The Body was short in Proportion to its Thickness, and the Tail-End roundish, but irregular: occasioned by the Tail's lying within the Body.

The Arms, in a little while, extended themselves pretty much, at which Time the Figure of it was as represented below.



I turned this *Polype* at eleven o'Clock in the Morning, and observing it again about five in the Afternoon, found it then on the Tail-End, waving about its Arms. The Head or Mouth-Part being placed upwards, and directly under my Eye, appeared by the Microscope as a large wide round Opening, like the Mouth of a *China Jar*: down which I could see so distinctly, as clearly to discern several of the Lice, which had been on the Outside when I turned it, now crawling about nimbly within the Body, whose Sides kept asunder, and formed a considerable Cavity,

Cavity, bellying out immediately below the Mouth. Dr. PARSONS, who was with me, made a very exact Drawing of its Appearance, from which the small One below is copy'd.



By saying I found it on the Tail-End, I would not be understood to mean that it was fixed by the Tail, as *Polypes* usually are; for it did not adhere at all. But the Tail-End being somewhat flattish, it had placed itself thereon, and seemed to chuse that Position: for when I put it on one Side, it quickly turned itself upright again.

July, 7.--Looking on my *Polype* this Morning, I found it divided in two Pieces a little below the Circle of its Mouth and Arms. The Head-Part had turned itself right again, and appeared with its Arms like a Star, as in the Head of the first Experiment. The Body was still inverted, but more colourless than yesterday, slimy, and without any Signs of Life that I could be certain of.

I put

I put it by itself in a Glass of fresh Water, and looked at it frequently, but saw no Distension or Contraction: before Night it was almost all dissolved, and next Morning Nothing could be seen but Slime.

The Head-Part seiz'd a Piece of Worm, and in about a Week produced a new Body with the Right-Side out, as in other *Polypes*.

Though I made several Trials before and since, I could never succeed in turning *Polypes*, so well as in the above Experiment: which I impute to my Want of the Means Mr. TREMBLEY uses, as well as the Dexterity whereof he is Master: whose Account of his having turned many, and their living, thriving, and producing young Ones in that inverted State, I don't in the least doubt the Truth of. And when that Gentleman pleases to publish his own Method, which I should think myself unworthy of knowing if I endeavoured to take any of the Honour of it from him, most reasonable People, I believe, will be convinced.

Notwithstanding, this Operation will always be attended with great Difficulty: and none must expect to succeed in it, but those who have much Patience, Care, and Dexterity; and have, moreover, been exercised in the nicest manual Experiments.

EXPERIMENT XIX.

An Attempt to make the divided Parts of different POLYPES unite.

AUGUST, 4, 1743. Mr. TREMBLEY having informed us, that he sometimes had found Means to make the divided Parts of different *Polypes* grow together, so as to form a Creature by the Conjunction of the Head-Part of one Animal with the Tail-Part of another, I was desirous of trying the same Experiment: and chusing for that Intention two *Polypes* of an equal Bigness, as nearly as I could judge, that they might the better tally together; I placed them in a Drop of Water, on a Slip of Paper, side by side, with their Heads turn'd the same Way; that, as soon as cut asunder, the Head-End of either might easily be brought to the Tail-End of the other.

Being disposed after this Manner, I waited till they both were extended at the same Time, and then watching my Opportunity, I divided them both, at one Stroke of the Scissors, Paper and all, exactly through the Middle of their Bodies.

My Paper was pretty broad, that one Part of it might not fall from the other upon cutting: and by making an Hollow in it, I contrived that the two *Polypes* might
lye

lye in a Drop of Water, large enough for them to swim and extend in, without adhering to the Paper.

The four Pieces, after Cutting, lay in this Drop as I intended, and stuck so little to the Edges of the Paper cut therewith, that I instantly disengag'd them; and then, as fast as possibly I could, brought the Head-Parts of one to the Tail-Parts of the other, at the Ends where they had been separated. But, although I was not long in doing this, the wounded Ends had begun to contract and round themselves, before I could possibly make them meet: and after many Trials I found they would not adhere.

Mr. TREMBLEY mentions this as an Experiment attended with much Difficulty, and what frequently fails to succeed; nor does he say any thing of the Way he performs it; and therefore I have given my Manner of attempting it, and my Disappointment therein; hoping somebody else may contrive to bring the Parts more suddenly together; for on that, I apprehend, the whole Success of the Experiment depends; since, it is highly probable, if they could be brought in contact almost instantaneously after Cutting, they would readily unite.

The four Pieces were kept in Water, and in a few Days, they all became handsome and perfect *Polypes*.

This

This Experiment I repeated several Times over, as also that of making the divided Parts of the same *Polype* grow together again, but had never the good Luck to succeed in either.



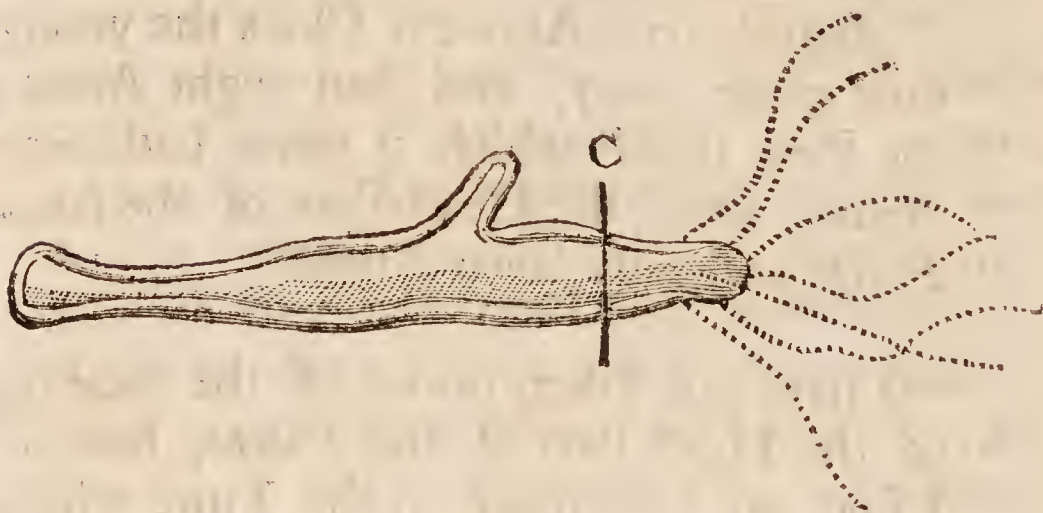
The following Experiments, with some Observations immediately succeeding them, and accurate Drawings thereto belonging, which the Figures here can but indifferently imitate, were communicated to me by a most diligent and unprejudiced Enquirer into Nature and Searcher after Truth, whose valueable Friendship I am extremely obliged to, and whose Name (had I leave to mention it) would be an Honour to my Performance.



EXPERIMENT XX.

A speedy Reproduction of a new Head.

“ THE fourth of *August*, 1743, at
 “ twenty Minutes after eleven o’Clock,
 “ I cut a *Polype* which had seven Arms and
 “ a young One rising from it, but without
 “ Arms, as represented in the under Figure,
 “ where the Line (c) shews the Place of
 “ Cutting.



“ The Head-Part extended its Arms im-
 “ mediately, but would not eat a Worm
 “ put to it.
 “ *August*, 5.---This Morning, at eleven
 “ o’Clock, the young One remaining upon
 “ the Tail-Part had six Arms. The Part
 “ cut appeared rounded.
 “ *August*, 6.---At twelve o’Clock, the
 “ Tail-Part was not only healed and sharp,
 “ but

“ but had apparently five Arms, tho’ very
 “ short, as represented below.



“ I gave it a Worm, which it catched
 “ hold of, though the Arms did not then
 “ appear more extended than they are shewn
 “ in the Drawing.

“ *August, 10.*--At one o’ Clock the young
 “ One came away, and had eight Arms:
 “ the Part from which it came had nine
 “ Arms, altho’ the Head-Part of the same
 “ *Polype* had only seven Arms.

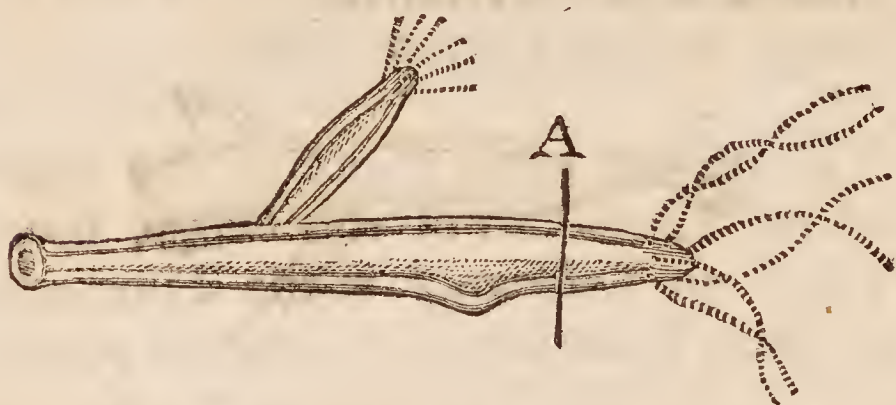
“ I have not taken notice of the healing
 “ of the Head-Part of this *Polype*, because
 “ I find no Difference in the Time which
 “ all these Parts require to become perfect.



EXPERIMENT XXI.

A young POLYPE becoming its Parent's Head.

“ *AUGUST*, 15, 1743. At 4 o’Clock,
 “ I cut a *Polype* which had twelve
 “ Arms (although fix of them are only re-
 “ presented in the Drawing) and a young
 “ One dependent with seven Arms; oppo-
 “ site to which, but nearer the Head, was
 “ a small Protuberance, as represented un-
 “ derneath, where the Line A. shews the
 “ Incision.



“ *August*, 17.---The Head-Part was heal-
 “ ed: the young *Polype* upon the Tail-
 “ Part came away: the first Protuberance
 “ was increased, and another appeared on
 “ the contrary Side, as the Figure shews.



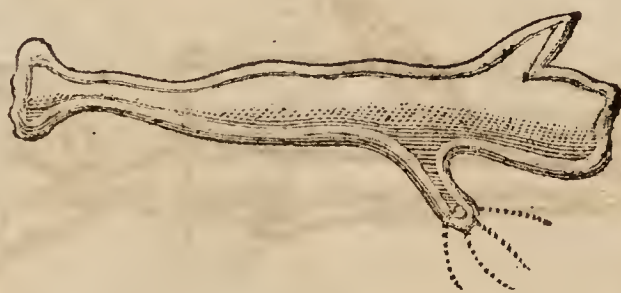
“ *Au-*

“ *August, 18.*---At six in the Afternoon,
 “ the first Protuberance appeared with a
 “ sharp Point, like an Arm, growing from
 “ the Middle of the Head, as below.

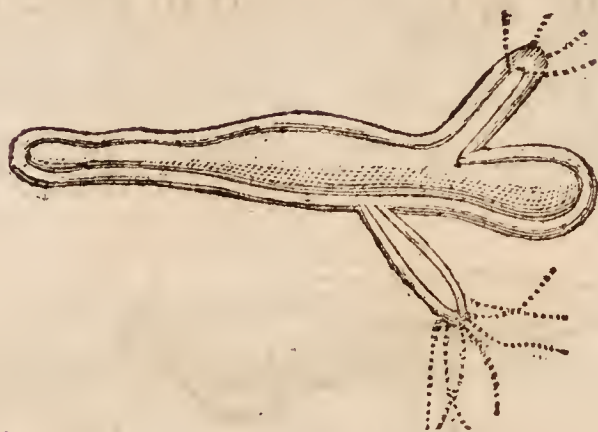


“ The opposite Excrescence was increas-
 “ ed.

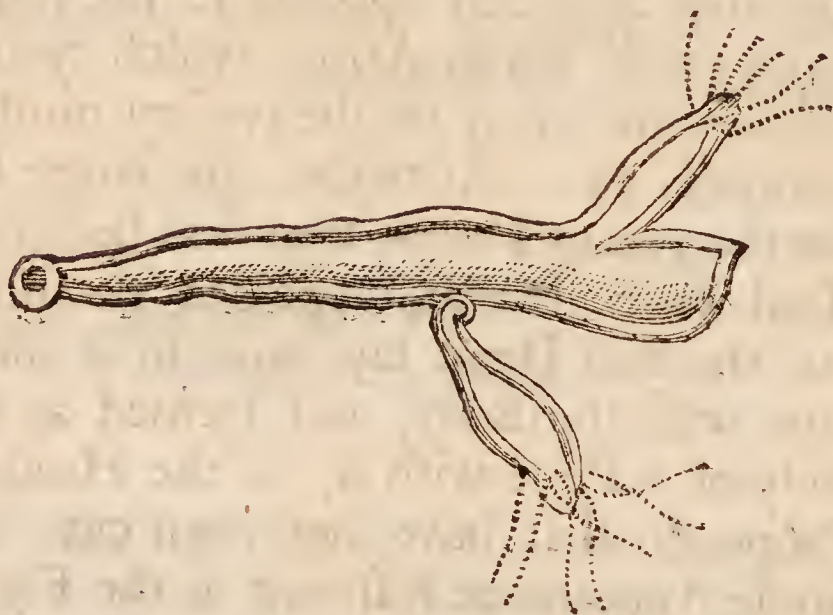
“ *August, 19.*---At forty Minutes after
 “ eight in the Evening, the young *Polype*
 “ had four Arms very distinct, and the op-
 “ posite Excrescence appeared sharp and
 “ pointed as in the Drawing.



“ *August, 20.*---At seven in the Evening,
 “ the first young *Polype* had seven Arms,
 “ and that opposite was thicker than young
 “ *Polypes* generally are, and had four short
 “ Arms, as the Figure in the following
 “ Page shews.

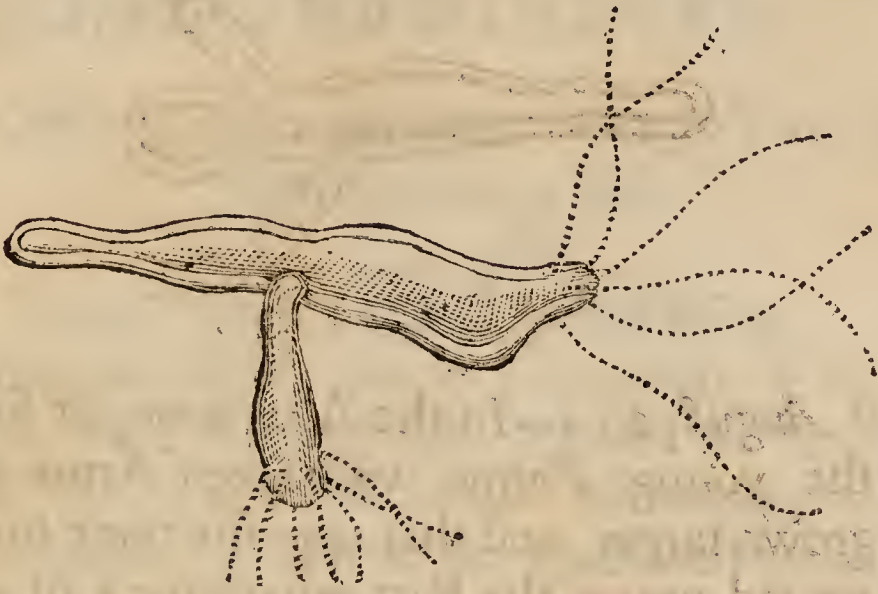


“ August, 21.---In the Afternoon, at four,
 “ the young *Polype* with seven Arms was
 “ grown larger, and that opposite there to ap-
 “ peared nearer the Part where the Cut was
 “ made. The Gut passed beyond the *Polype*,
 “ but with a Communication as below,



“ August, 22.---At a Quarter after eleven,
 “ the young *Polype* with seven Arms was
 “ grown longer: the opposite *Polype* was
 “ apparently sunk from its former Appearance,
 “ and was now the Head of the Tail-
 “ Part of its Parent. There were no Re-
 “ mains of the Projection beyond it, but a
 “ Thick-

“ Thickness making something of an Angle
 “ under it, as represented in the Figure.



“ In this Shape it continued till the twenty
 “ seventh, at twelve, when a small Pro-
 “ tuberance appeared opposite to the young
 “ *Polype* with seven Arms, which young
 “ *Polype* came away on the twenty-ninth.

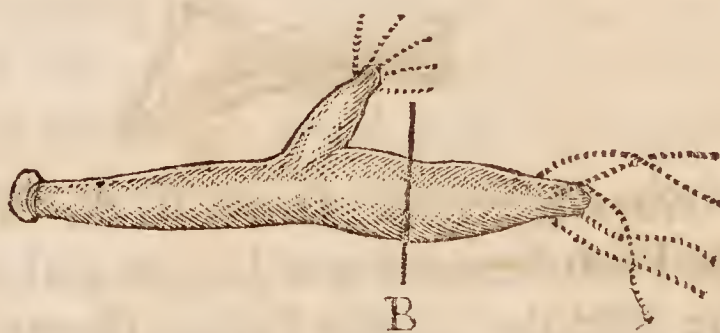
“ *August, 31.*---At twelve, the Angle be-
 “ low the young *Polype*, that was become a
 “ Head to its Parent, appeared no more,
 “ but the said Head lay now in a direct
 “ Line with the Body, and seemed as en-
 “ tirely of a Piece with it, as the Heads of
 “ *Polypes* do that have not been cut. Its
 “ whole Appearance is shewn in the Figure
 “ underneath.



EXPERIMENT XXII.

A cut POLYPE producing a young One, but not repairing itself.

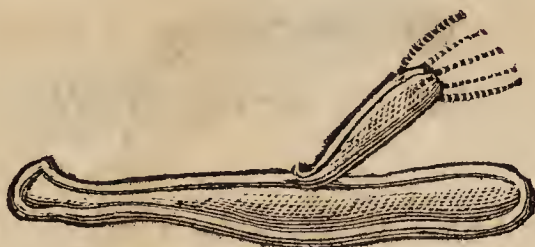
“ *AUGUST*, 22, 1743. After I had
 “ observed a young *Polype* become it-
 “ self an Head to the headless Part which
 “ produced it, I was desirous to try whe-
 “ ther this Appearance was so extraordinary
 “ as it seemed to me, not having been
 “ mentioned in any of the Accounts of
 “ these Creatures I have seen; and there-
 “ fore, at twelve Minutes after eleven, I
 “ cut a *Polype* with five Arms, which had
 “ also a young One with five Arms depen-
 “ dent on it, as represented in the Figure
 “ underneath, where the Line B shews the
 “ Place where it was cut.



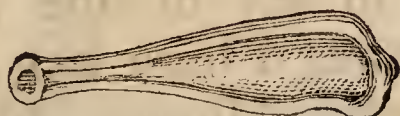
“ *August*, 24.---I found it much the same
 “ as when cut.

“ *August*,

“ *August, 25.*--- At eleven, it appeared
 “ rounded at the End where cut, as be-
 “ low.



“ *August, 27.*--- At half an hour past
 “ eleven, the young One came away, and
 “ the cut Part from being round appeared
 “ as in the Figure.



“ *August, 28.*---At twenty minutes after
 “ seven in the Evening, a considerable Pro-
 “ tuberance appeared on one Side, opposite
 “ to that whence the young One had come,
 “ in the Manner of the next Figure.



“ *August, 29.*--- At ten in the Morning,
 “ the Protuberance was longer and sharp in
 “ the Middle, as the Figure shews.



“ At

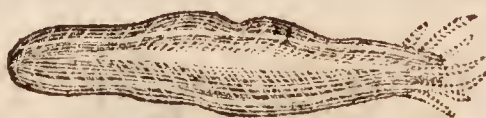
“ At eight the same Evening two Arms
 “ were visible, the Head rounded, and
 “ the rest of the Body as below.



“ *August, 30.*---At two o’Clock, it ap-
 “ peared as in the Figure following.



“ *August, 31.*---At one, the Appearance
 “ of the *Polype* was chang’d in the Man-
 “ ner represented below.

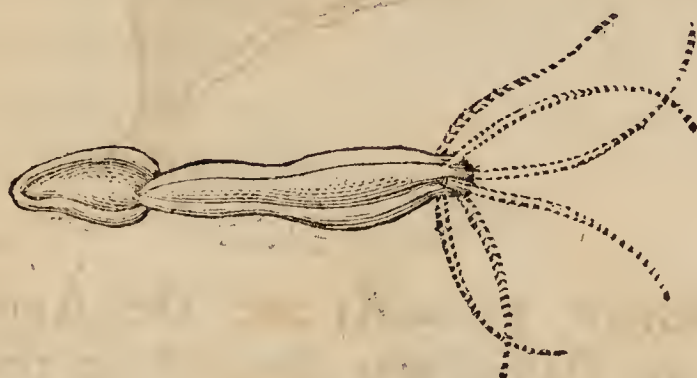


“ It continued thus without any remark-
 “ able Alteration, till
 “ *Sept. 6.*---At twelve, when upon Ex-
 “ amination I found the young One plainly
 “ distinct from the Parent, and dependent
 “ upon the Place where the Parent was cut
 “ and the Head usually grows after the
 “ Operation. The Representation adjoined
 “ will explain my Meaning.

“ *Sept.*



“ Sept. 7.---At thirty minutes past eleven
 “ the young One seemed dependent only by
 “ the Point of its Tail, and appeared as be-
 “ low.



“ I apprehend in a few Days it will come
 “ away.

“ What is strange in this Appearance is,
 “ that the Part of a *Polype* cut off the
 “ twenty-second of *August* should continue
 “ producing Young to this Day, without
 “ having gained to itself Head or Arms, or
 “ becoming in any Degree more perfect than
 “ it was when cut.

The same curious Gentleman goes on thus
 in his Observations.

“ I shall now give you an Account of two
 “ seemingly strange, or at least uncommon

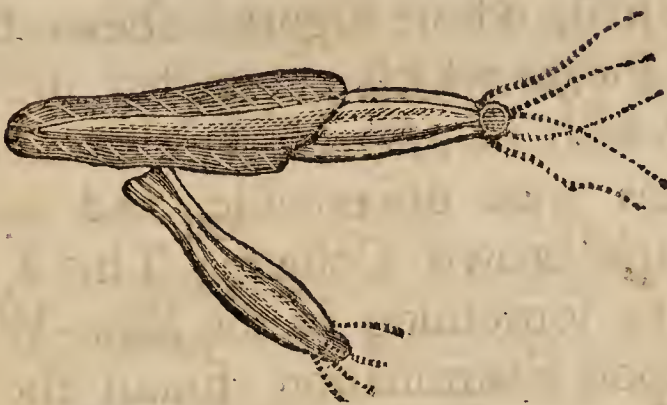
“Appearances in *Polypes* which have not
 “been cut; one of them not at all, the
 “other only Part of two Arms taken off.

“The first, whose Figure is shewn below,
 “was a *Polype* which contracted itself the
 “twenty-fifth of *August*, so that none of
 “its Arms were discernable, and became
 “of a dark brown Colour. This I attri-
 “buted to something in the Rain-Water;
 “and, upon Examination, found the Wa-
 “ter had come from a Place where some
 “Lime had been left,



“I immediately changed the Water, and
 “the *Polype* the next Day extended itself a
 “little, but still the Arms were invisible.
 “In this Condition it remained, although
 “the Water was daily changed, till the se-
 “cond of *September*, at eleven o’Clock,
 “when I discover’d the Head and Arms
 “extended by my naked Eye; and exami-
 “ning it with the Microscope it appeared
 “invelop’d in a thick Cloud, or Skin, of
 I “a blewish

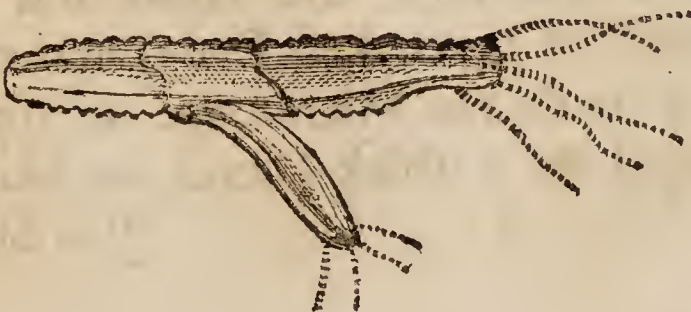
“ a blewish white Colour, in the Form
 “ represented underneath.



“ The Head and Tail appearing at each
 “ End, and the young One adhering to this
 “ Part, made me conclude it was really the
 “ Skin of the Parent,

“ *Sept. 3.*---At two o’Clock, the Head
 “ and good Part of the Body appeared clear
 “ of this Skin, which was shrunk lower
 “ than the Day before, but the Tail was
 “ covered with it: only the Gut of the
 “ *Polype* was visible through it. In this
 “ Condition it continued, the outer Skin
 “ only growing whiter to the seventh of
 “ *September*, at eleven, when it appeared
 “ as represented in the Figure below.

a



“ The

“ The outer Skin was greatly lessen’d,
“ but there appear’d a Break quite across
“ the Gut of the *Polype*, easily discerned
“ through the Skin, a little below the de-
“ pendent young One at (a).

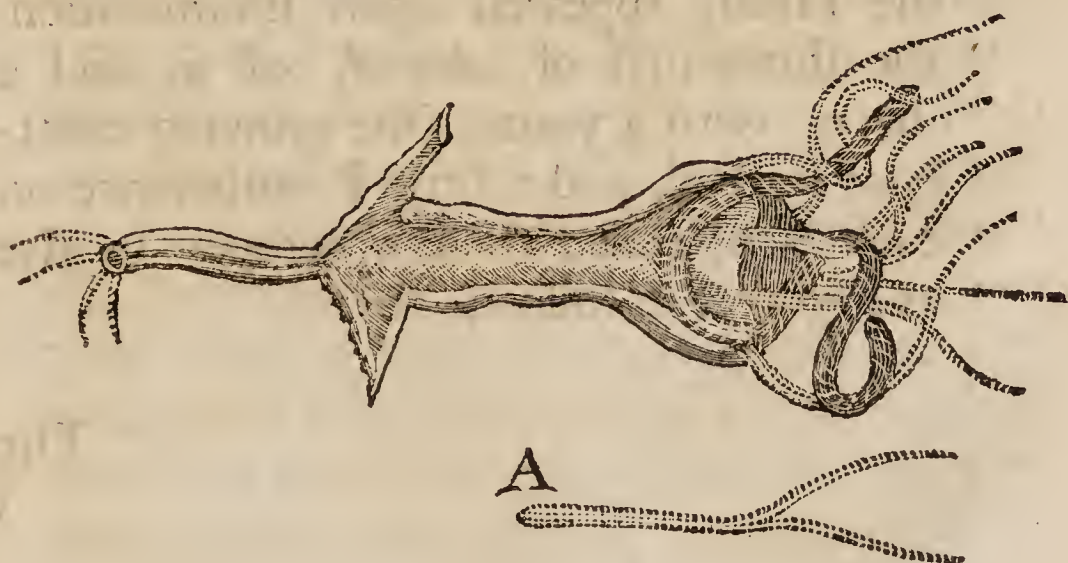
“ I make no doubt, you know that
“ when a *Polype* dies it dissolves in the Wa-
“ ter: now, whether this outer Skin has
“ done so, or that at the Beginning it was
“ a Swelling which abated by the Change of
“ the Water, I shall not determine: altho’
“ its first seeming to draw downwards to-
“ wards the Tail, and decreas’ing upwards
“ towards the Head, would induce one to
“ suspect something of the Insect’s casting
“ the Skin hurt by the Lime-Water.

“ The other Particular I proposed to men-
“ tion, is this; a *Polype* which had two of
“ its Arms cut off, but without touching
“ the Head, appeared upon Examination,
“ the thirty-first of *August*, of so odd a
“ Shape, with a young One growing exact-
“ ly at its Tail, and a little Protuberance on
“ each Side, that I thought proper to give
“ its Figure, as follows.

“ The



“ The Arms which had been cut the
 “ twenty-seventh of *August* were not distin-
 “ guishable from the rest, all being con-
 “ tracted as in the above Figure: but the
 “ first of *September* I found it playing its
 “ Arms at full Length, and then One of
 “ them appeared double or forked, but all
 “ the others as usual. In order to know
 “ whether it was a Mistake, or if the In-
 “ sect would use the double Arm, I gave it
 “ a Worm, which it caught greedily, and
 “ used the forked Arm like the rest. The
 “ Arm is shewn underneath at A, and the
 “ *Polype* itself above it eating a Worm.



“ Here

“ Here the young One at its Tail appears
“ with four Arms, and very long; the two
“ at the Sides seem sharp.

“ *Sept. 2.*---The young One came away
“ perfect from the Tail, and the other two
“ continued very thriving.

“ I am now going to take notice of some
“ Circumstances in relation to the Faculty
“ these Creatures have of removing from
“ one Place to another, or after their Food
“ or Prey, which they do not seem to per-
“ ceive till it has touched them, and then
“ they generally catch hold of it, by ex-
“ tending their Arms or Bodies, the Tail
“ remaining fixed to some Part of the Glass:
“ and when they change Place, I have
“ commonly observed that they do it by
“ laying their Tails over their Heads, or their
“ Heads over their Tails, for they do both:
“ the Insect appearing in a Ring at that
“ Time.---But the twenty-seventh of *Au-*
“ *gust*, at one o’Clock, after I had put a
“ Worm into the Glass with the Head-
“ Part of a cut *Polype* which had recover-
“ ed the Operation, whilst I was observing
“ it play with the Worm, and that had, by
“ a sudden Jerk, cast itself a little Way
“ from the *Polype*, I thought I saw the
“ *Polype* shoot after it: and it did catch the
“ Worm again. I then took a Magnifier,
“ (the *Focus* I think about three Inches)
“ and

“ and searching for something in the Glass
 “ to measure from, that I might be more
 “ certain of the Truth, I found a little Speck
 “ in the Bottom of the Glass, even with that
 “ Part below the Head of the *Polype* from
 “ which the Arms rise. Keeping my Eye
 “ fixt to the Speck and *Polype*, I plainly
 “ saw it thrust itself forwards with a seem-
 “ ing Spring; so that the Speck in the Glass
 “ was now even with the upper Part of
 “ the Tail: and, in a Second after that, the
 “ *Polype* thrust itself forwards in the same
 “ Manner, and left the Speck in the Glass
 “ about the twelfth Part of an Inch behind
 “ it.

“ During all these Motions I could not
 “ perceive either the Arms or Body more
 “ extended than when I first put in the
 “ Worm, altho’ I attended particularly to
 “ that Circumstance.

“ I don’t know whether you have found
 “ any of the Arms cut off, without any
 “ Part of the Head or Body adhering, to
 “ be endued with the restoring Quality
 “ which the Body has: but I have tryed the
 “ Experiment four Times; and altho’ the
 “ Arms cut off continue with Life, con-
 “ tracting and extending themselves, and
 “ waving about; yet the second Day they
 “ have always dissolved, and appeared like

“ transparent Dust, all the *Papillæ* being
 “ scattered *.

Since the preceeding Sheets have been printed off, my worthy Friend Mr. MILES has sent me some *Polypes*, taken by him at *Tooting*; with an exact Description of the Place where they were found; which I shall beg leave to insert, as it may prove of singular Service to direct People in what Sort of Places to search for them with a Probability of Success, and also as it is a Confirmation of what was said before on this Subject (Page 62.) from the Information of some other Friends.

In a Letter, dated *September 17, 1743*, he writes thus.---“ I have now the Satisfaction
 “ to tell you, that I yesterday met with a
 “ large Number of *Polypes* about a Quarter
 “ of a Mile from us, in a Place I had never examined till then.

“ It is a Ditch, supplied from a Spring in
 “ the Neighbourhood, that is never known
 “ sensibly to increase or decrease; the Water about a Foot deep, and the Bottom
 “ lined with a light ouzy Mud, consisting
 “ of the decayed Leaves of Plants and other

* I have tried the same Experiment several Times with exactly the like Success.

“ Materials, but little of it pure Mud. The
 “ Sun shining thereon, and the Water be-
 “ ing very transparent, the Bottom made
 “ an Appearance beautiful enough, some-
 “ what like very fine Moss, mixed with a
 “ Number of Water-Snail-Shells, Peri-
 “ winkles, &c.

“ Having tryed the thicker heavier Mud
 “ oftentimes without Success, I was invi-
 “ ted the rather to try this, and according-
 “ ly brought Home a little of the Water
 “ with some of the Plants growing in it,
 “ the Principal of which being, if I mis-
 “ take not, one of the Species of the *Equi-*
 “ *setum palustre**.

“ After it had stood an Hour or two in
 “ my large Glas-Jar, I observed several
 “ *Polypes*, in all respects like those I receiv-
 “ ed of you: excepting that they are many
 “ Times smaller when viewed with a *Lens*
 “ of an Inch *Focus*, than those we have in
 “ our Nursery are when beheld with the
 “ naked Eye. Indeed I never saw any
 “ Branchers so small as these; and yet they
 “ seem to be in Health.

“ When I first met with them, I spent
 “ some Time in observing them, to see what
 “ Food they eat: but I could not find they
 “ eat any thing besides small Worms, so

* Several Pieces of this Plant were sent over among the
Polypes that came from Mr. TREMBLEY.

“ small as not to equal one of their Arms in
 “ Thickness ; which, if I can judge by
 “ their Motion, (for I could not examine
 “ their Form with a deep Magnifier) are
 “ the Worms which produce Gnats, just
 “ come out of the Egg ; besides which I
 “ see nothing proper for their Food in this
 “ Water, (I mean for Bulk) except the
 “ Animalcules which infest them : and per-
 “ haps they are Vermin to them.

“ I am attempting to nurse some of them
 “ up, to see whether they will not increase
 “ in Size ; and should be glad to know
 “ whether they are ever found so large in
 “ Ditches as ours are that are kept in the
 “ House.

This Gentleman has since informed me,
 that the Water at the Spring Head is thought
 somewhat hard, but is exceedingly fine and
 well tasted, and, where he found the *Pol-
 ypes*, glides along very leisurely : that he had
 sought for them within an hundred Yards
 of the Place, in vain, but that the Mud or
 Soil at the Bottom where he formerly tried
 was altogether different, being very thick,
 heavy and black : that he has been told the
 Ditch where he met with them was cleaned
 (as they term it) twice this Summer, which
 may account for the Lightness of the Soil
 at Bottom : and that there is not a Leaf of
 the *Lens palustris* to be seen in it, which he
 ascribes

ascribes to the same Cause, since all the neighbouring Ditches are covered with it.

These *Polypes* at first were full as small as the green Ones described Page 20. They were also very white or pale, through Emptiness; but eat Pieces of Worms greedily; and after being fed appeared of a red Colour, from the Blood of the Worm seen through their Skin. Most of them that I have are furnished with seven Arms, and are generally extended ready to seize their Prey.

They are now thriven to such a Degree, by good Feeding, as to be doubly the Size they were when taken, but seem at their utmost Growth.



C H A P. XI.

A Microscopical Discovery.

HAVING lately had the Pleasure of shewing, SIR, to You and several other curious Gentlemen a Discovery made by the Microscope, which both You and They have judged worthy Notice; I hope it will not be thought improper to add it to these Experiments.

Keeping a small Quantity of the black Mud of the *Thames* with some Worms therein to feed my *Polypes*, in an earthen Vessel that contains about half a Pint; I poured every Day a little Water thereon, to supply the Worms with fresh Nourishment and prevent their becoming putrid. This Water, however, I constantly drained off in a few Minutes, leaving none of it in the Vessel but what the Mud soaked in; so that it appeared always moist, but never wet.

In some Mud that had been thus treated for about a Fortnight, I observed in many Places, and particularly about its Edges, on the sixteenth of last *September*, a great many glittering or shining minute Bodies, in Appearance and Size not much unlike some of the clear transparent Grains of large Sea-Sand, which indeed at first I imagined them

to

to be: but examining them with more Attention, I could perceive with my naked Eye, that they were little transparent oval Bodies, about the twentieth of an Inch in Height, having a small black Crown or Button at the Top of each. They stood upright in the Mud pretty close together, and made a very pretty Appearance.

Pleased with this Sight, I immediately placed one of them before the Microscope, and found the Shape thereof exactly resembling a *Florence* Flask with the Bottom upwards, and thereon a round Button or Crown somewhat depressed upon the Top, as in the Figure.



The Body and Neck of the Flask, if I may term them so, appeared as if full of the clearest Water, and were so perfectly transparent, that when their *Focus* was adjusted to the *Focus* of the Magnifier, the Windows of some opposite Houses could plainly be distinguished through them; and, as you was pleased to observe, were represented inverted in the same Manner they would have

been if seen through a Piece of Glass of the like Form.

The Crown, Cap, or Button at Top was black on the upper Part, with certain irregular little Ramifications thereon of somewhat a whitish Cast: (See Fig. II.) but down its Sides to where it joyns the Flask it was of a yellowish tawny Colour; and the Flask itself had a little yellowish Tinge when viewed in a Side-Light.

While I was examining this curious Object, the Sides of it began to shrivel, collapse together, and grow opake, by the drying of the little Lump of Mud whereon it stood: but upon applying a Drop of Water thereto, in a Minute's Time it became again plumped out and transparent under my Eye, and seemed, as before, like a Glass filled with Water.

This seems to be a minute Plant, not yet, I think, described: of a very extraordinary Form and Growth. Its Root is in the Mud, whence it rises on a Stalk or Stem like the Neck of a Flask; and, probably, the black globular Body on the Top is its Fruit or Seed.

They continued a few Days, but cold Weather coming on, they disappear'd all together.

The

The CONCLUSION.

HAVING now, SIR, laid before you the most remarkable of my Experiments, in relation to the cutting *Polypes* afunder, and the Re-production of new Parts to make each Piece a perfect *Polype*; I shall entreat your Patience a little longer, whilst I add a few occasional Reflections..

When Accounts of the extraordinary Properties of this Creature were communicated to you from the *Hague* by the Honourable Mr. BENTINCK, from *Versailles* by Mr. BUFFON, and from *Paris* by Mr. REAUMUR, as well as by Mr. TREMBLEY himself, all attesting the Truth thereof upon their own repeated Experience; they were received with a due Regard to the Character and Reputation of the said Gentlemen, who are known full well to be Persons of too good Understanding to be themselves imposed on, and too much Honour and Veracity to attempt to impose on Others: tho' it was never expected we should rest contented with their Accounts without making Experiments ourselves: *Nullius in Verba* being the wise Motto and establish'd Maxim of the ROYAL SOCIETY. But in respect to the Reputation of the ROYAL SOCIETY,
as

as well as to the Gentlemen who communicated these Discoveries, it became incumbent on us, as soon as they had sent the Insects over hither, to put them to a severe but speedy Trial, and from the Issue of our own Experience, either convince the World that these Gentlemen had been mistaken, or give our Testimony that what they affirm is true. This, SIR, was your Opinion: such a Trial you put them to without Delay; and by three or four Experiments, which you was pleased to publish, the Doubts of most that have read them, are, I believe, removed; but as in Cases of an extraordinary Nature, the Experiments and Attestations of different People serve more effectually to establish Truth, I have thought proper, (by those I have just now laid before you,) to give my Evidence also; since it may contribute something towards encouraging Foreigners to communicate any curious Discoveries they may happen to make hereafter, when they find we receive them in a civil Manner, and take some Pains to do them Justice. And, indeed, this Publication is in some Manner become my Duty, as several other Gentlemen, after satisfying themselves by cutting these Creatures asunder and observing their Reproduction, have been pleased to suppress their own Experiments in Compliment to mine.

Though

Though real Facts are incontestable Arguments, and no Reasoning seems necessary after so many repeated Experiments, there are certain Prepossessions, Prejudices and Humours among Mankind (arising from early imbibed Theories or Systems, according to which they have accustomed themselves to judge of Things) that make People sometimes disbelieve even what they see, are stronger than Reason, and will hardly be conquer'd even by the plainest Facts.

Hence it is that some have objected to the Reality of the *Polype's* being a living Creature, notwithstanding its moving from Place to Place, seizing its Prey, eating, digesting, and other Animal Functions: because its other Properties happen to be unsuitable to their Hypothesis of Life in general.

If the Animal Soul or Life, say they, be one indivisible Essence, all in all, and all in every Part, how comes it, in this Creature, to endure being divided forty or fifty Times, and still continue to exist and flourish?

Again: If animal Identity, say they, consists in Consciousness; and if every living Creature is sensible of Pleasure and Pain, or in other Words has a Consciousness, which most think a reasonable Supposition; when the *Polype* is divided into several Parts, all soon becoming perfect *Polypes*, where shall
we

we find the Identity of the original *Polype*?

These Queries, I must acknowledge, I am wholly incapable of resolving: but let those who tie themselves down to such Theories seriously consider, whether they believe themselves so perfectly acquainted with every living Creature God has made, and with all the Modes and Circumstances of the Life of each, as to be certain their Theories comprehend them all. 'Tis, methinks, a little presuming to restrain the Operations of Nature, or imagine that God has done nothing but according to certain Rules well known to us.

There are other People still, who, altho' convinced of Facts, remain dissatisfied unless all the Steps whereby those Facts are brought about can be mechanically described, and a Reason assigned for them. Hence it comes to pass, that some who have been Eye-witnesses of the Cutting and Reproduction of these Creatures, and have no Doubt at all remaining as to the Reality of what has been related concerning them, are yet frequently enquiring how their wonderful Faculties can be accounted for, and wherefore they are bestowed on this Animal. To which I answer:--- no otherwise, in my Opinion, than by resolving them into the Will and Pleasure of their almighty Creator

Creator; which I likewise believe the most reasonable Way of accounting for the Qualities or Properties of most other Things around us. To which give me leave to add, that if we would employ more of our Time and Pains to discover what the Forms and Qualities of Things really are, and amuse ourselves less with accounting for them and finding out why they are, (which is aiming beyond our Reach) we should probably be wiser, and perhaps better.

Our Senses, with all the Assistances we can give them, are capable of informing us but to a certain Degree: our Understanding is likewise limited in its Judgment according to the Information of our Senses; whereby it is evident, that our Senses and Understanding are adapted to each other, and that our Understanding is properly and usefully employed when we examine by it the different Forms and Circumstances of Things Animate or Inanimate which our Senses present before us. But it is a kind of Madness, or at best mis-spending Time, to hunt after the hidden and invisible Causes or *Modus operandi* of such Forms or Qualities, which we can never possibly find out.

It is one great Part of Wisdom to know what we have Abilities for, and what Things are beyond our Power; that we may apply to the former, and avoid perplexing ourselves

selves about the latter. How much valuable Time has been thrown away in framing whimsical, unsatisfactory Schemes to account for the Operations of Nature, which might have furnished a great deal of profitable Knowledge, if spent in real Experiments on those self-same natural Operations?

The great Mr. BOYLE, in his *Essays*, expresses himself finely to this Purpose. “When
 “ a Writer, says he, acquaints me only with
 “ his Thoughts or Conjectures, without en-
 “ riching his Discourse with any real Ex-
 “ periment or Observation, if he be mista-
 “ ken in his Ratiocination, I am in some
 “ Danger of erring with him, or at least
 “ am like to lose my Time, without re-
 “ ceiving any valueable Compensation for
 “ so great a Loss; but if a Writer endea-
 “ vours, by delivering new and real Obser-
 “ vations and Experiments, to credit his
 “ Opinions, the Case is much otherwise:
 “ for let his Opinions be ever so false (his
 “ Experiments being true) I am not obli-
 “ ged to believe the former, and am left
 “ at Liberty to benefit myself by the latter;
 “ and though he have erroneously super-
 “ structed upon his Experiments, yet, the
 “ Foundation being solid, a more wary
 “ Builder may be much farthered by it, in
 “ the Erection of a more judicious and con-
 “ sistent Fabrick.”

Curiosity

Curiosity and a Fondness of Novelty are implanted by Providence in the Mind of Man, to make him observe and examine Things attentively, distinguish their various Production, Form and Structure, and admire their Beauties, Properties and Use. Whilst he is doing this, he is improving his Judgment, performing his Duty, and making himself happy. But this should be done with Modesty, laying aside all Prejudice and Obstinacy, cautious of giving Way to the Delusions of Imagination, or being tyed down to any Opinions, whatever great Name are subscribed to them; since nothing, perhaps, hinders the Improvement of Knowledge so much as the Belief that we know Things sufficiently already.

Natural History is very deficient as to the larger Animals, and more so in regard to Insects: but when we come to the minute Creation, 'tis almost a *Terra incognita*: therefore here every Thing must appear wonderful and extraordinary, as the *Polype* does at present; not that considered in itself it is more so than thousands of other Things, whose Frequency makes them disregarded by us, though possess'd of Qualities no less deserving our Admiration, or easier to be accounted for.

To mention one single Instance.---How wonderful are the Properties of the Loadstone!

stone! How surprizing its Power of communicating them to Iron!---A Piece of this Metal, only by being rubbed on it in a particular Direction, becomes in a few Moments attractive of every other Particle of Iron or Loadstone it comes near; and, if brought in contact, strongly adheres thereto: though it still retains a total Indifference for Gold, Silver, Lead, Copper, and every Thing besides. At the same Instant, it acquires, likewise, a Polarity, whereby the two contrary Points thereof (if it be so suspended as to turn at Liberty in the Air) will constantly direct themselves to the different Poles of Heaven, and if displaced return to them again, and rest no where else at Quiet: this too with a certain amazing Inclination, Declination, and Variation, altering in Degree according to the Parts of the World it is carried to. And these Properties, though thus suddenly acquired, remain with it not for a few Days and Weeks only, but for Years and Ages.

Were such Things related to us of some certain Stone, in a foreign Country, which we could not procure a Sight of, 'tis likely we should suspect the Relator was imposing on our Understanding: and those that live under the Line probably think the same of the northern People, when they tell them, that, in their Country, Rivers and Seas are sometimes

times made so hard, in the Compass of a few Days, that Armies may walk dry-shod over them.

But daily Experience shews us these Effects of the Loadstone: they are plain and obvious to our Senses, and consequently proper Subjects for the Exercise of our Reason: which by considering them will find Means of employing them to many useful Purposes, and must necessarily lead us to revere the unfearchable Wisdom of that almighty Being who has endowed them with such amazing Properties.---In our Examination thus far we stand justified both to Reason and Religion: but when we attempt beyond this, and pretend to discover and describe the Machinery whereby, and the Manner how these wonderful Effects are performed, which we neither have Senses to discern, nor Abilities to judge of, all is Darkness and Uncertainty, we plunge into an unfathomable Abyss without either Star or Compass to direct our Course, and are in the utmost Danger of Shipwrecking our Understanding.

Which of the many Hypotheses, contrived to account for these Changes, can furnish any reasonable Satisfaction? or deserves to be regarded otherwise than as a pretty In-

vention, a Cobweb of the Brain?---What do we really understand when we are told, “ That
 “ the magnetical Effluvia do not proceed
 “ intrinsically from the Stone, but are cer-
 “ tain extrinsical Particles, which approach-
 “ ing to the Stone and finding congruous
 “ Pores and Inlets therein, are channel’d
 “ through it, and having acquired a Motion
 “ thereby, do continue their Current so far,
 “ till being repulsed by the ambient Air,
 “ they recoil again and return in a vortical
 “ Motion, and so continue their Revolution
 “ for ever through the Pores of the Mag-
 “ net? ”—Such Examples will, I hope, be
 my Excuse for not attempting to solve any
 of the Phænomena of the *Polype*, for which
 I have neither sufficient Ingenuity nor In-
 clination.

I much question if we are not also greatly mistaken when we undertake to form a Judgment of the Sensations, Perceptions, Ideas and Understanding of other Creatures; since we have no Means of doing it but by the Standard of our own: which is, perhaps, as unfit for the Purpose as a Pair of Scales would be to measure the Height and Dimensions of a Building.

The Percussion of Light or Air, or the Contact of other material Bodies on Nerves
 dis-

disposed in different Parts about us, and indued with different Degrees of Sensibility, occasion all our Sensations and Perceptions. But the Sensations of the Nerves of the Eye are in ourselves so different from those of the Nerves of the Ear, that if either of these Organs be wanting, the Ideas commonly taken in thereby cannot be supplied or made intelligible.

Therefore, as we are taught by Experience, that 'tis hardly possible to give a blind Man any just Ideas of a seeing Man's Sense of Colours, or a deaf Man of a hearing Man's Perception of Sounds, though they are Creatures of the same common Nature and in every thing else alike, would it be more strange if we should be as little capable of understanding or judging of the Sensations and Perceptions of Animals in many Respects different from Mankind?

May there not be more Modes of Feeling than those five we call the Senses, which are bestowed on us for our Information of what passes near us, and by pleasing or disagreeable Sensations warn us of what is profitable or prejudicial to us, and consequently what to chuse, and what avoid? May not other Creatures, whose Structure, Organs and Way of living bear no Resemblance to ours, (as Body may act on Body in various Manners) have Sensations also different from

ours, not only in Degree but Kind, for their particular Security and Happiness?

This Supposition would account in some Sort for the Sagacity we may observe in every Species, (which can perhaps be solved no better Way) and give a clear Meaning to the Word Instinct, which is very confused at present: for it would then imply certain Impressions made on the Organs of Animals by Things about them, for their Information of what is hurtful or beneficial to them. Should this be the Case, every Kind of Animal must have Sensations distinct and different from those of every other Kind, and what cannot possibly be known or understood by them: which Difference must be also as various as their Organs are. And if so, when we undertake to judge of the Actions, Abilities and Understanding of other Creatures, we are imitating the blind Man, who supposed that a Scarlet Colour is like the Sound of a Trumpet: and there may be more Truth than is commonly imagined in the Saying of MONTAIGNE, when he was playing with his Cat, that it was not impossible she might think him as great a Fool as he thought her.

If we seriously examine ourselves, we shall be sensible how little we understand, even of those Things we may be supposed to know

know the best. Our Capacities are certainly best adapted to the Examination of our own Bodies, and what more immediately relates to their Production, Safety and Use: yet after the Enquiries of Ages, what Discoveries are made continually, and how much still remains unknown? Can we tell certainly the Offices of all the Parts of our own Bodies, and how each performs its Duty? Do we know in what Manner, or by what Kind of Chemistry, all the Variety of Food, animal and vegetable, of different Tastes, Qualities and Colours, are converted into the same common red Fluid call'd Blood? What know we yet of the digestive Power of the Stomach, which in a few Hours will soften hard Substances, and even dissolve Bones?

If we consider the Generation of ourselves, which we may be supposed to understand better than that of other Creatures; How is a Child produced?—If it be according to the ancient Theory, by a Mixture of seminal Matter, different as to Heat and Cold, Moisture and Dryness, and assisted by a Plastic Nature: or if, according to the modern Hypothesis, it be by an Animalcule finding Entrance into an *Ovum*, where, meeting with proper Nourishment, it thrives, and

puts on a Form quite different from what it had before; or, as others hold, from an *Aura*, or certain *Effluvia*, pervading and impregnating the female *Ova*:—In the first Case, what Similitude has this mixt seminal Matter to the Fashion of a Child? and what is this Plastic Nature that favours it with a Form?—In the Second Case, How is this Animalcule itself, and the *Ovum* that receives it, generated?—Or what are the *Effluvia* supposed by Others?—Consider it, how you please, is not this as amazing as the Production of the *Polype*?

When a Twig is cut off, and by planting in the Earth becomes a Tree of the Kind whereof it was a Part, can we account for its becoming so, any thing better than we can for the like Effect in a *Polype*? or is there any Reason to suppose Providence incapable of bestowing the same Ability on an Animal? The whole Difference is, we have known the One a long while, and the other is a late Discovery, which has not yet been noticed in our System of animal Life: but now we are become acquainted with it, let us raise our Thoughts from the Creature to the Creator, and not shut our Eyes to such visible Marks of the invisible Operations of the Deity.

'Tis

'Tis no great Wonder that Discoveries contrary to old and established Opinions should not at first be credited; but then, neither should they be absolutely rejected till Experiment has been made whether they are true or false.

There is a middle Way between Over-credulity and an absolute Denial of the Possibility of a Thing, which a Man of Sense and a Philosopher should always steer in: for 'tis as contrary to his Character rashly to reject any Thing, because it has not come to his Knowledge, or that he can't account for it, as it is to believe whatever is told him before he has examined it. Experiment is the Test of Truth, and that should always be made before we wholly assent or dissent. But if Facts come well attested by Persons of Judgment and Credit, however extraordinary they may seem, they deserve civil Treatment till they can be examined fully. Not many Ages since, the Belief of the Antipodes, and the Motion of the Earth, was not only thought ridiculous, but wicked: and several other Realities have been as much discredited formerly as they are now established.

Those that know the most, are most sensible how little they know in comparison of

P 4

what

what is yet unknown, and therefore consider Things with Modesty and Candour: but Ignorance cries out at once, it cannot be:---inconsiderately measuring the Powers of Nature by the scanty Compass of its own Experience, and more ready to reject the Truth than take the Pains to find it out.--- A truly wise Man is so fully sensible how little he knows, and what Things he once was ignorant of, which he is now acquainted with, that he is far enough from supposing his own Judgment a Standard of the Reality of Things.

Providence has thought fit to confine Man's Understanding within a very narrow Circle: he sees some few of the Things immediately at Hand, and knows a little of their exterior Figure and Colouring; but as to their Composition and internal Properties, every Leaf, Feather, Pebble, or Shell can prove the Ignorance of the wisest Man that lives. His Knowledge is, however, adapted to his Wants, and sufficient for his Happiness, which must arise from his own Searches and Discoveries; and perhaps it is happy for Mankind in general, that all the Knowledge they are capable of attaining should not flow on them at once, but be acquir'd by slow Degrees; and that enough
should

should be left for future Ages. Is not the high Relish of Life in Children owing in a great Measure to the Novelty of every thing about them? and must it not be a Satisfaction to reflect, that in the grand Universe there is Room for new Discoveries and Observations on the Operations of the DEITY throughout all Eternity?

Now, SIR, it is high Time to put an End to this long Letter, wherein I don't pretend to give a full Account of this wonderful Animal, the *Polype*, but only a few Observations made according to the best of my Judgment, and some Experiments faithfully related; which, I hope, may serve to satisfy the Enquiries of the Curious, till they have Opportunities of examining and judging for themselves; and it is with great Satisfaction I address this Attempt to One in whom the Scholar and the Gentleman are remarkably united, and whose Candor and Good-nature will, I know, set others an Example of excusing its Inaccuracies and Defects: One so singularly happy as to be Master of every Science without Pride, Affectation, or Vanity: affable, courteous, and communicative to All: a zealous Encourager of every Kind of Knowledge, and a steady Advocate for Truth.---Happy is the
Royal

Royal Society in having such a PRESIDENT!
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crown'd with Prosperity and Honour, is
the sincere Wish of,

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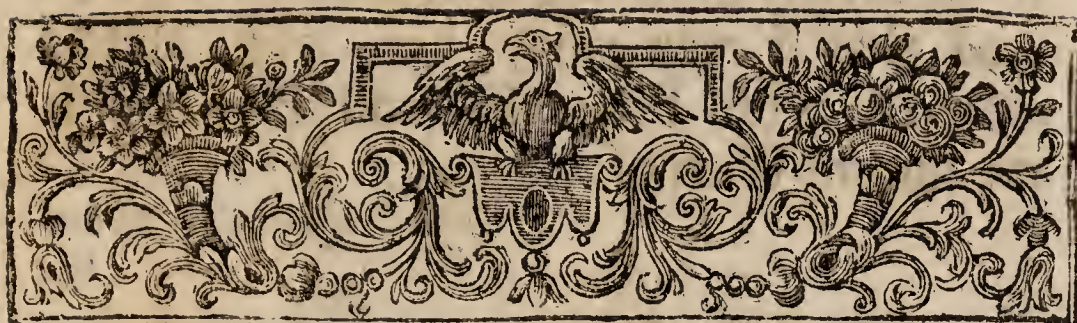
Your most obedient

O^cob. 1. 1743.

And most humble Servant

Henry Baker.





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